ALAGAPPA UNIVERSITY

KARAIKUDI-630 003, TAMILNADU

DIRECTORATE OF DISTANCE EDUCATION

M.B.A. (Hospital Management)

(IV Semester)



PAPER-4.2

HOSPITAL HAZARDS MANAGEMENT

Paper 4.2: HOSPITAL HAZARDS MANAGEMENT

UNIT 1

Hospital Hazards: Meaning – Types – Physical – Biological – Mechanical – Psychological – Its impact on employees – Preventive measures.

UNIT 2

Hospital Hazards Management: Meaning – Need – Principles – Purpose.

UNIT 3

Hospital Related Infection: Types of infection – Common Nosocomial infections and their Causative agents – Prevention of hospital acquired infection – Role of the Central Sterile Supply Department – Infection Control Committee – Monitoring and control of cross infection – Staff health.

UNIT 4

Biomedical Waste Management: Meaning – Categories of biomedical wastes – Disposal of biomedical waste products – Incineration and its importance – TNPCB Rules and Schedules – Standards for waste autoclaving, microwaving and deep burial – Segregation, packaging – Transportation and storage.

UNIT 5

Human Waste Disposal and Sewage Disposal: Diseases carried from excreta – Sanitation barrier – Methods of excreta disposal – Sewage Wastes: Meaning – Composition – Aims of sewage disposal – Decomposition of organic matter – Modern sewage treatment – Drawbacks of improper disposal of wastes – Solid and liquid.

UNIT 6

Medical Insurance: Insurance companies – Life Insurance for people with medical problems – Medicare – Third Party Insurance – Paramount Health Care Services – Star Health and Services Ltd. – ICICI Lombard Insurance Co. – Their payment terms and conditions.

REFERENCE BOOKS:

1. Park K, *Preventive and Social Medicine*.
2. Park K, *Text Book on Hygiene and Preventive Medicine*, Banarsidas Bhanot.

Course Material Prepared by –

Thiru. S. Sethu
Principal, Devaki Institute of Health Sciences
Karaikudi.

UNIT – 1

HOSPITAL HAZARDS

Occupational health is essentially preventive medicine. The joint ILO/WHO Committee on Occupational Health, in the course of its first session, held in 1950, gave the following definition: "Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risks resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological equipment, and, to summarize, the adaptation of work to man and of each man to his job.

Preventive medicine and occupational health have the same aim – 'the prevention of disease and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations; the levels of application of preventive measures are the same – health promotion, specific protection, early diagnosis and treatment, disability limitation and rehabilitation; the tools are the same – epidemiologic approach, statistics, health screening, health education, etc. Occupational health, therefore, is the application of preventive medicine in all places of employment.

In the past, it was customary to think of occupational health entirely in relation to factories and mines; hence the terms "industrial hygiene" or "industrial health" were in vogue. Modern concepts of occupational health now embrace all types of employment including mercantile and commercial enterprises, service trades like hospitals, forestry and agriculture and includes accidents, toxicology in relation to industrial hazards, industrial rehabilitation and occupational psychology. Occupational health in agriculture and ergonomics (human engineering) are relatively new concepts.

Ergonomics is now a well recognised discipline and constitutes an integral part of any advanced occupational health service. The term "ergonomics" is derived from the Green ergon, meaning work and nomos, meaning law. It simply means: "fitting the job to the worker". Training in ergonomics involves designing of machines, tools, equipment and manufacturing processes, layout of the places of work, methods of work and environment in

order to achieve greater efficiency to both man and machine. The object of ergonomics is "to achieve the best mutual adjustment of man and his work, for the improvement of human efficiency and well-being". The application of ergonomics has made a significant contribution to reducing industrial accidents and to the overall health and efficiency of the workers.

Health of the Worker

Hospital workers constitute only a segment of the general population and the factors that influence the health of the population also apply equally to hospital workers, i.e. housing, water, sewage and waste disposal, nutrition education. In addition to these factors, the health of the hospital workers, in a large measure, will also influenced by conditions prevailing in their work place. The declared aims of occupational health is to provide an occupational environment in order to safeguard the heal of the workers and to set up hospital improvement.

Types of Occupational Environment

By "occupational environment" is meant the sum of existing conditions and influences which prevail at the place of and which have a hearing on the health of the work population. The hospital worker today is placed in a complicated environment which is getting more complicated types of interaction in a working environment.

(1) Man and physical, chemical and biological agents
(2) Man and machine
(3) Man and man

(1) Man and Physical, Chemical and Biological Agents

- ***Physical Agents:*** The physical factors in the work environment which may be adverse to health are heat, humidity, air movement, heat radiation, light, noise, vibration and ionizing radiation. The factors act in different ways of combinations. The amount of working and breathing such as toilet, washing and bathing facilities are also important factors in an occupational environment.
- ***Chemical Agents:*** It comprise a large number of chemicals, toxic dusts which are potential hazards to the health of the workers. The

chemical agents cause disabling respiratory illnesses, cause injury to skin and some may have a deleterious effect in the blood and other organs of the body.

- ***Biological Agents:*** The workers may be exposed to viral, rickettsial, bacterial parasitic agents which may result from close contact animals or their products, contaminated water, soil or food.

(2) Man and Machine

An industry or hospital implies the use of machines drives power. The ungues machines, protruding and moving parts, poor installation, of plant, lack of safety measures are the causes of accidents which is a major problem. Working for long hour unphysiological postures is the cause of fatigue, back bone diseases of joints and muscles and impairment of the worker's health and efficiency.

(3) Man and Man

There are numerous psychosocial factors which operates in the place of work. These are the human relationships among workers themselves on the one hand, and those in authorities on the other. Examples of psychosocial factors: the type and rhythm of work, work stability, service stations, job satisfaction, leadership style, security, workers satisfaction, communication, system of payment, welfare actions, degree of responsibility, trade union activities and a host of similar other factors, all entering the human relationships. In modern occupational health, emphasis is upon the people, the conditions in which they work, their hopes and fears and their attitudes towards their fellow-workers and employers.

Hospital environment of the worker cannot be spared apart from the domestic environment. Both are complementary to each other. The worker takes his worries and brings to his work disturbances which arise in his domestic environment. Stress at work may disturb his sleep, just as at home may affect his work. Severe prolonged stress may produce serious physical or mental symptoms which do not allow man to work efficiently. According to ecological approach, hospital represents a dynamic equilibrium or adjustment between hospital worker and his hospital environment.

HOSPITAL HAZARDS

Hospital worker may be exposed to following types of hazards, depending upon his occupation:

(1) Physical hazards

(2) Chemical hazards

(3) Biological harzards

(4) Psychosocial hazards

1. Physical Hazards

Heat and Cold: The common physical hazard in most hospitals is heat. The direct effects of heat exposure are burns, exhaustion, heat stroke and heat cramps; the indirect effects are decreased efficiency, increased fatigue. Physical work under such conditions is very stressful and impairs the health and efficiency of the workers. For gainful work involving sustained and hard effort, a reasonable temperature must be maintained in work room.

Important hazards associated with cold work are chilblains, immersion foot, and frostbite.

Light: The workers may be exposed to the risk of poor light or excessive brightness. The acute effects of poor light are eye strain, headache, eye pain, lachrymation, sensation around the cornea and eye fatigue. Exposure to positive brightness or "glare" is associated with discomfort and visual fatigue. Intense direct glare may also bring in blurring of vision and lead to accidents. There should be sufficient and suitable lighting, natural or artificial, wherever persons are working.

Noise: Noise is a health hazard I many hospitals. The effects of noise are of two types:

- Auditory effects which consist of temporary or permanent hearing loss
- Non-auditory effects which consist of nervousness, fatigue, interference with communication by speech, decreased efficiency and annoyance.

The degree of injury from exposure to noise depends upon a number of factors such as intensity and frequency range, duration of exposure and individual susceptibility.

Vibration: Vibration, especially in the frequency range 10 to 500 Hz. may be encountered in work with pneumatic tools such as drills and hammers. Vibration usually affects the hands and arms. After some months or years of exposure, the fine blood vessels of the fingers may become increasingly sensitive to spasm (white fingers). Exposure to vibration may also produce injuries of the joints, of the hands, elbows and shoulders.

Ultraviolet Radiation: Occupational exposure to ultraviolet radiation occurs mainly in X-ray. Such radiation mainly affects the eyes, causing intense conjunctivitis and keratitis (welder's flash). Symptoms are redness of the eyes and pain, these usually disappear in a few days with no permanent effect on the vision or on the deeper structures of the eye.

Ionizing Radiation: Ionizing radiation is finding increasing application in medicine. Eg. x-rays and radio active isotopes. Important radio-isotopes are cobalt 60 and phosphorus 32. Certain tissues such as bonemarrow are more sensitive than others and from a genetic standpoint, there are special hazards when the gonads are exposed. The radiation hazards comprise genetic changes malformation, cancer, leukaemia, depilation, ulceration, sterility and in extreme cases death. The International Commission of Radiological Protection has set the maximum permissible level of occupational exposure at 5 rem per year to the whole body.

2. Chemical Hazards

There is hardly any hospital which does not make use of chemicals. The chemical hazards are on the increase with the introduction of newer and complex chemicals. Chemical agents act in three ways: local action, inhalation and ingestion. The ill-effects produced depend upon the duration of exposure, the quantum of exposure and individual susceptibility.

Local Action: Some chemicals cause dermatitis, eczema, ulcers and even cancer by primary irritant action; some cause dermatitis by an allergic action. Some chemicals, particularly the aromatic nitro and amino compounds such as TNT and aniline are absorbed through the skin and cause systemic effects.

Inhalation:

- *Dusts:* Dusts are finely divided solid particles with size ranging from 0.1 to 150 microns. They are released into the atmosphere during crushing, grinding, abrading, loading and unloading operations. Durst particles larger than 10 microns settle down from the air rapidly, while the smaller ones remain suspended indefinitely. Particles smaller than 5 micros are directly inhaled into the lungs and are retained there. This fraction of the dust is called "respirable dust", and is mainly responsible for pneumoconiosis. Dusts have been classified into inorganic and organic dusts; soluble and insoluble dusts. The inorganic dusts are silica, mica, coal, asbestos dust etc; the organic dusts are cotton, jute and the like. The soluble dusts dissolve slowly, enter the systemic circulation and are eventually eliminated by body metabolism. The insoluble dusts remain, more or less, permanently in the lungs. They are mainly the cause of pneumoconiosis. The most common dust diseases in this country are silicosis and anthracosis.
- *Gases:* Exposure to gases is a common hazard. Gases are sometimes classified as simple gases (e.g. oxygen, hydrogen), asphyxiating gases (e.g. carbon monoxide, cyanide gas, sulphur dioxide, chlorine) and anesthetic gases (e.g. chloroform,. ether, trichloroethylene). The ill-effects depend upon the duration of exposure and the dose or concentration of exposure. Unlike the pneumoconiosis, most chemical intoxications respond favourably to cessation, exposure and medical treatment.

Ingestion: Diseases may also result from ingestion of chemical substances such as lead, mercury, arsenic, zinc, chromium, cadmium, phosphorus etc. Usually these substances are swallowed in minute amounts through contaminated hands, food or cigarettes. Much of the ingested material is excreted through faces and only a small proportion may reach the general blood circulation.

3. Biological Hazards

Workers may be exposed to infective and parasitic agents at the place of work. The occupational diseases in this category are brucellosis, leptospirosis, anthrax, hydatidosis, psittacosis, tetanus, encephalitis, fungal infections, schistosomiasis and a host of others. Persons working among animal products

(e.g. hair, wool, hides) and agricultural workers are specially exposed to biological hazards.

4. Psychosocial Hazards

The psychosocial hazards arise from the workers' failure to adapt to an alien psychosocial environment. Frustration, lack of job satisfaction, insecurity, poor human relationships, emotional tension are some of the psychosocial factors which may undermine both physical and mental health of the workers. The capacity to adapt to different working environments is influenced by many factors such as education, cultural background, family life, social habits, and what the worker expects from employment.

The health effects can be classified into two main categories:

(a) Psychological and behavioural changes: including hostility, aggressiveness, anxiety, depression, tardiness, alcoholism, drug abuse, sickness absenteeism;

(b) Psychosomatic illhealth: including fatigue, headache; pain in the shoulders, neck and back; propensity to peptic ulcer, hypertension, heart disease and rapid ageing.

Reports from various parts of the world indicate that physical factors (heat, noise, poor lighting) also play a major role in adding to or precipitating mental disorders among workers. The increasing stress on automation, electronic operations and nuclear energy may introduce newer psychosocial health problems in hospital. Psychosocial hazards are therefore assuming more importance than physical or chemical hazards.

Hospital Diseases and Its Impact on Employees

Hospital diseases are usually defined as diseases arising out of or in the course of employment. For convenience, they may be grouped as under:

1. Diseases due to physical agents:

(1) Heat — Heat hyperpyrexia, heat exhaustion, heat syncope, heat cramps, burns and local effects such as prickly heat.

(2)	Cold	Trench foot, frost bite, chilblains.
(3)	Light	Occupational cataract, miner's nystagmus.
(4)	Pressure	Caisson disease, air embolism, blast (explosion)
(5)	Noise	Occupational deafness.
(6)	Radiation	Cancer, leukemia, aplastic anemia, pancytopenia
(7)	Mechanical factors	Injuries, accidents
(8)	Electricity	Burns

2. Diseases due to chemical agents:

(1) Gases: CO_2, CO, HCN, CS_2, NH_3, N_2, H_2S, HCl, SO_2 – these cause gas poisoning.

(2) Dusts (Pneumoconiosis):

(i) Inorganic Dusts:

(a) Coal dust - Anthracosis

(b) Silica - Silicosis

(c) Asbestos - Asbestosis, Cancer lung

(d) Iron - Siderosis

(ii) Organic (Vegetable) Dusts:

(a) Cane fibre - Bagassosis

(b) Cotton dust - Byssinosis

(c) Tobacco - Tobacossis

(d) Hay or grain dust - Farmers' lung

(3) Metals and their compounds:

Toxic hazards from lead, mercury, cadmium, manganese, beryllium, arsenic, chromium etc.

(4) Chemicals: Acids, alkalies, pesticides

(5) Solvents: Carbon bisulphide, benzene, trichloroethylene, chloroform etc.

3. Diseases due to biological agents:

Brucellosis, leptospirosis, anthrax, actinomycosis, hydatidosis, psittacosis, tetanus, encephalitis, fungal infections etc.

4. Cancers:

Cancer of skin, lungs, bladder.

5. Dermatosis:

Dermatitis, eczema

6. Diseases of psychological origin:

Industrial neurosis, hypertension, peptic ulcer etc.

Preventive Measures

(1) ***Dust Control:*** Measures for the prevention and suppression of dust such as wet process, enclosed apparatus, exhaust ventilation etc. should be used.

(2) ***Personal Protection:*** Personal protective equipment (masks or respirators with mechanical filters or with oxygen or air supply) may be necessary.

(3) ***Medical Control:*** Initial medical examination and periodical medical check-ups of workers are indicated.

DERMATITIS

Dermatitis is a big health problem in many hospitals. The causes may be; Physical – heat, cold, moisture, friction, pressure, x-rays and other rays; Chemical – acids, alkalies, dyes, solvents, grease, tar, pitch, chlorinated phenols

etc. Biological – living agents such as viruses, bacteria, fungi and other parasites; Plant products – leaves, vegetables, fruits, flowers, vegetable dust etc.

The dermatitis – producing agents are further classified into: (i) primary irritants and (ii) sensitizing substances. Primary irritants (e.g. acids, alkalies, dyes, solvents, etc) cause dermatitis in workers exposed in sufficient concentration and for a long enough period of time. On the other hand, allergic dermatitis occurs only in small percentage of cases, due to sensitization of the skin.

Prevention:

Dermatitis is largely preventable if proper control measures are adopted:

(1) ***Pre-selection:*** The workers should be medically examined before employment, and those with an established or suspected dermatitis or who have a known pre-disposition to skin disease should be kept away from jobs involving a skin hazard.

(2) ***Protection:*** The worker should be given adequate protection against direct contact by protective clothing, long leather gloves, aprons and boots. The protective clothing should be frequently washed and kept in good order. There are also, what are known as barrier creams which must be used regularly and correctly. There is no barrier cream so far invented which will prevent dermatitis in all occupations.

(3) ***Personal Hygiene:*** There should be available a plentiful supply of warm water, soap and towels. The worker should be encouraged and educated to make frequent use of these facilities. Adequate washing facilities in industry are a statutory obligation under the Factories Act.

(4) ***Periodic Inspection:*** There should be a periodic medial check-up of all workers for early detection and treatment of dermatitis. If necessary, the affected worker may have to be transferred to a job not exposing him to risk. The worker should be educated to report any skin irritation, no matter how mild or insignificant.

RADIATION HAZARDS

X-rays are used both in medicine and industry. Exposure to ultraviolet rays occurs in arc and other electric welding processes. Infrared rays are produced in welding, glass blowing, foundry work and other processes where

metal and glass are heated to the molten state and in heating and drying of painted and lacquered objects.

Effects of Radiation

Hospital hazards due to ionizing radiation may be acute burns, dermatitis and blood dyscrasias; chronic exposure may cause malignancies and genetic effects.

Preventive Measures

- Inhalation, swallowing or direct contact with the skin should be avoided
- In case of x-rays, shielding should be used of such thickness and of such material as to reduce the exposure below allowable exposures
- The employees should be monitored at intervals not exceeding 6 months by use of the film badge or pocket electrometer devices
- Suitable protective clothing to prevent contact with harmful material should be used
- Adequate ventilation of work-lace is necessary to prevent inhalation of harmful gases and dusts
- Replacement and periodic examination of workers should be done every 2 months. If harmful effects are found, the employees should be transferred to work not involving exposure to radiation
- Pregnant women should not be allowed to work in places where there is continuous exposure.

SICKNESS ABSENTEEISM

Sickness absence is an important health problem in hospitals. It may seriously impede production with serious cost repercussions, both direct as well as indirect. As the production techniques become more sophisticated, absenteeism tends to increase the adverse repercussions. Absenteeism is a useful index in industry to assess the state of health of workers, and their physical, mental and social well-being.

Incidence:

India has a working force of 5 million in registered factories. Research undertaken by the National Productivity Council (N.P.C) into absenteeism showed a marked increase from around 8 to 13 per cent in the early 1950s to around 15 to 20 per cent or even more in recent years. The rate of absenteeism was reported to be 8 to 10 days per head per year.

Causes:

The causes of sickness-absenteeism may not be entirely due to sickness:

(1) ***Economic Causes:*** Studies have shown that if the worker is entitled to sick leave with pay, he tends to avail of this privilege by reporting sick. It is so well remarked that in industry the workers declare themselves fit or unfit for work, at their choice.

(2) ***Social Causes:*** Certain social factors appear to influence sickness absenteeism in India. These are the social and family obligations such as weddings, festivals, repair and maintenance of ancestral house and similar other causes. Some of the workers who come from rural areas go back to their villages, for short or long periods, during sowing and harvest seasons.

(3) ***Medical Causes:*** About 10 per cent of the days lost were found to be due to occupational accidents. Respiratory and alimentary illnesses have also been found to be important causes.

(4) ***Non-occupational Causes:*** Certain non-occupational causes such as nutritional disorders, alcoholism and drug addiction have also been found to be responsible for sickness-absenteeism.

(5) ***Prevention:*** The prevention/reduction of sickness absenteeism would result in better utilization of resources and maximising the production. The methods for reducing sickness absenteeism include: (i) good factory management and practices (ii) adequate preplacement examination (iii) good human relations and (iv) application of ergonomics.

HEALTH PROBLEMS DUE TO INDUSTRIALISATION

Industrialisation implies the transformation of a peasant society into a community dependent upon the industries. It involves individual and collective technical skills for the manufacture of particular goods through highly specialised processes. There is division of work under the same roof with emphasis on mass production and community profit. In short, industrialisation means a social and economic revolution in the culture of a nation. Any such revolution is bound to carry with it some associated hazards.

The community health problems arising out of industrialisation may be enumerated as follows:-

- A rise in the number of slums and insanitary dwellings is one of the chief problems in all industrial areas due to migration of people from the country-side for employment.
- Hospital wastes may contain acids, alkalies, oils and other organic and inorganic chemicals, some of which may be toxic.
- Pollution control measures should be instituted in the planning stage itself in the process of industrialisation.
- Air pollution is due to the discharge of toxic fumes, gases, smoke and dusts into the atmosphere. It requires proper town planning and zoning to eliminate this hazard.
- Lack of facilities for the disposal of sewage leads to pollution of water supply, contamination of soil with parasites and their ova.
- The main problems in hospital areas are tuberculosis, venereal disease, and food and water borne infections. Hospital areas without proper sewage disposal have become hot-beds for filariasis owing to the breeding of the mosquito vectors in contaminated water
- The standards of food sanitation are bound to be lowered due to industrialisation, if proper precautions are not taken. Food-borne infections such as typhoid fever and viral hepatitis are all too common in India.
- Mental health problems are due to altered living conditions.

- Failure of adjustment leads to mental illness psychoneurosis, behaviour disorders, delinquency etc.
- Accidents are a public health problem in industrial areas due to congestion, vehicular traffic and the increased tempo of life.
- Alcoholism, drug addiction, gambling, prostitution, increased divorces, breaking up of home, juvenile delinquency, higher incidence of crime are some of the social problems.
- Vital statistical rates indicate that industrial areas are characterised by high morbidity and mortality from certain diseases.

MEASURES FOR HEALTH PROTECTION OF WORKERS

1. Nutrition

Malnutrition is an important factor contributing to poor health among workers and low work output. Malnutrition may also affect the metabolism of toxic agents and also the tolerance mechanisms. If the worker carries his own lunch to work, provision should be made for a safe and uncontaminated place to store the food before it is eaten to avoid spoilage or contamination. Likewise, some place separate from the workroom should be provided so that the meal may be eaten in sanitary surroundings.

2. Communicable Disease Control

The hospital provides an excellent opportunity for early diagnosis, treatment, prevention and rehabilitation. It is a general objective everywhere, to detect cases of communicable disease and to render them non-infectious to others by treatment or removal from the working environment, or both.

The communicable diseases of special importance in India are tuberculosis, typhoid fever, viral hepatitis, amoebiasis, intestinal parasites, malaria and venereal diseases. There should be an adequate immunization programme against preventable communicable diseases.

3. Environmental Sanitation

Within the hospital establishment, the following need attention for the prevention of the spread of communicable diseases by water, food or other means:

- The common glass tumbler for drinking water should be abandoned as it spreads infection.
- If food is sold, its sanitary preparation, storage and handling are essential. Education of food handlers and other measures may be necessary to prevent outbreaks of gastro-intestinal disease.
- There should be sufficient number of latrines and urinals of the sanitary type, separate for males and females, conveniently situated.
- Garbage and waste disposal should be such as to avoid the breeding of files and vermin.
- The dust which settles down on the floor and machinery should be promptly removed by vacuum cleaners or by wetting agents before it is redistributed into the atmosphere by the vibration of the machinery or buildings.
- The recommended standard is a minimum of 500 cu.ft. of space for every worker; space more than 14 feet above the floor level is not to be taken into consideration.
- There should be sufficient and suitable lighting, natural or artificial or both, in every part of the hospital where workers are working or passing through.
- Proper ventilation is also needed for the control of noxious vapours, fumes and dusts and prevention of fatigue and industrial accidents.
- The circulation of fresh air, and such a temperature as will secure to workers therein reasonable conditions of comfort and prevent injury to health.
- There should be adequate environmental controls designed to protect the workers against exposure to dusts, fumes and other toxic hazards.

4. Mental Health

The objective of an hospital health service is not only to keep the workers physically healthy, but mentally and psychologically stable. Hospital workers are susceptible to the effects of love, recognition, rejection, job satisfaction, rewards and discipline. The goals of mental health in hospitals are:

- To promote the health and happiness of the workers
- To detect signs of emotional stress and strain and to secure relief from them where possible.
- The treatment of employees suffering from mental illness, and
- The rehabilitation of those who become ill.

5. Measures for Women and Children

Women workers require special protection because:

- The developing embryo may be more susceptible to noxious agents than the exposed mother, e.g. in the case of methylmercur poisoning.
- Females may be less suited for some work than men; pregnancy may decrease the capacity to cope with many work factors
- Women tend to feed themselves less substantially than men and also restrict their nourishment in difficult economic circumstances.
- The infant mortality is higher amongst children of women employed in hospital work.

The following types of protection are available for women workers in hospitals:

- Expectant mothers are given maternity leave for 12 weeks, of which 6 weeks precede the expected date of confinement; during this period they are allowed 'maternity benefit', which is a cash payment, under the Employees State Insurance Act, 1948.
- Provision of free antenatal, natal ante-postnatal services.

6. Health Education

Health education is a basic health need. It is an important health promotional measure. Health education in the hospital setting should be envisaged at all levels – the management, the supervisory staff, the worker, the trade union leaders and the community.

7. Family Planning

Family planning is now recognised a decisive factor for the quality life, and this applies to hospital workers also. The workers must adopt the small family norm.

8. Maintenance and Analysis of Records

Proper records are essential for the planning, development and efficient operation of a hospital health service. The worker's health record and occupational disability record must be maintained. Their compilation and review should enable the service to watch over the health of the workers, to assess the hazards inherent in certain types of work and to devise or improve preventive measures.

9. Health Education and Counselling

Ideally, health education should start before the worker enters the hospital. All the risks involved in the hospital in which he is employed and the measures to be taken for personal protection should be explained to him. The correct use of protective devices like masks and gloves should also be explained. Simple rules of hygiene – handwashing, paring the nails, bodily cleanliness and cleanliness of clothes, should be impressed upon him. He should be frequently reminded about the dangers in hospitals through the media of health education such as charts, posters and hand bills. The purpose of health education is to assist the worker in his process of adjustment to the working, home and community environment.

Review Questions

1. Explain the factors that influence the health of the workers.
2. What are the occupational hazards?
3. Define sickness absenteeism.
4. What are all the health problems due to industrialisation?
5. Explain the measures for the health protections of workers.

* * *

UNIT – 2

HOSPITAL HAZARDS MANAGEMENT

"Hazard" means an activity, arrangement, circumstance, event, occurrence, phenomenon, process, situation, or substance (whether arising or caused within or outside a place of work) that is an actual or potential cause or source of harm. In effect a hazard can be interpreted as anything that can cause harm in terms of human injury or ill health, damage to property, damage to the environment or a combination of all these.

"Hazard Identification" is the process of recognising that a hazard exists and defining its characteristics.

"Hazard Assessment" is the overall process of determining whether a hazard is significant.

"Significant hazard" means a hazard that is an actual or potential cause or source of

i) Serious harm; or

ii) Harm (that is more than trivial) the severity of whose effects on any person depend on the extent or frequency of the person's exposure to the hazard; or

iii) Harm that does not usually occur, or is not easily detectable, until a significant time after exposure to the hazard.

"Harm" means illness, injury or both. The term is only used in the context of harm that is more than trivial.

"Serious Harm" is essentially a work-related injury, illness or condition that will result in admission to hospital for 48 hours or more or being off work for more than one week.

ACTIONS AND RESPONSIBILITIES

Responsibilities of Senior Managers

Senior managers are responsible for:

- Providing training for the hazard identification process
- Obtaining specialist advice when appropriate
- Encouraging all staff to be involved in the hazard identification process in their work areas (usually through a team approach); and
- Implementing the hazard management process.

A suggested method is as follows:

- Allocate time during a staff meeting to brainstorm all actual and potential hazards arising from the physical work area, the work itself and any work processes being carried out
- Document all hazards on the hazard management form.
- Carry out a risk assessment (see process and grid below) to set priorities.
- Evaluate hazards to establish which are significant (see definition above).
- Establish controls for each significant hazard by using the hierarchy of elimination, isolation and minimization; and
- Review and monitor the process regularly.

Risk Assessment

Risk assessment is the process of estimating the magnitude of the risk and deciding what actions to be taken. The following questions are asked to establish the risk:

(a) A Potential Severity Rating

What degree of injury or illness could occur?

i) Negligible

ii) Minor

iii) Major (includes possible long term disabling effects)

iv) Fatality

(b) A Probable Frequency Rating

With this hazard how likely is it that an injury or illness will occur?

i) Remotely possible

ii) Known to have happened in the past

iii) Strong possibility of it happening

iv) Has happened before within the company

v) Happens all the time

A risk assessment number for each hazard is compiled by using the table below. Hazards with the highest rating are given priority.

Severity		4	3	2	1
Frequency	5	20	15	10	5
	4	16	12	8	4
	3	12	9	6	3
	2	8	6	4	2
	1	4	3	2	1

The numbers are entered into the Risk Score column beside the hazard on the Hazard Management Form. *Significant Hazards* are identified according to the definition. Where a significant hazard is to be controlled, this must, if practicable, be by elimination. Where elimination is not practicable then the hazard must be isolated. Only where both elimination and isolation are not practicable, methods of minimization to be applied.

Responsibilities of Line Managers

Developing and implementing a programme for the control of significant hazards that have been identified, but have not been permanently controlled. Information on this control programme must be made available to staff members, and should include:

- the nature and location of the significant hazard
- the preferred method of control and steps to be taken
- the date by which work is to be completed
- the person(s) responsible for the work; and
- the date the action was completed

Responsibilities of Staff Members

- Participating in the process
- Reporting new actual or potential hazards as they arise; and
- Reporting any inadequate control measures.

HOSPITAL HAZARDS MANAGEMENT PLAN

Hazards Management Plan defines processes of a safe and healthy environment in which hazards are eliminated or minimized for employees, staff, patients and visitors and by which work-related injuries/ illness are minimised through a program of hazard reduction/ elimination, engineering controls, personal protective equipment, education and work-site surveillance.

Various risks and hazardous conditions are inherent in the health care environment and that processes must be implemented to reduce or eliminate these risks and hazards. These processes include:

- ❖ Safety committee with representatives from administration, clinical services and support services.
- ❖ General maintenance and supervision of grounds and equipment.
- ❖ Risk assessment to evaluate impact of buildings, grounds, equipment, occupants and internal systems on patient and public safety.

- ❖ Hazard surveillance including product recall/ alert evaluation.
- ❖ Reporting and investigation of emergencies, incidents, injuries and illness.
- ❖ Orientation and education.

Objectives

The objectives of this plan are:

- ➢ Continually evaluate the effectiveness of these processes to ensure performance improvement.
- ➢ Identify individuals to oversee development and implementation of these processes and to intervene whenever conditions pose an imminent threat to life and health or threaten damage to equipment and buildings.
- ➢ Communicate issues to appropriate departments/ units and hospital governance.
- ➢ Ensure that staff who participate in safety activities are knowledgeable.
- ➢ Distribute, practice, enforce and review safety policies and procedure as frequently as needed but at least every 3 years.

Approach Overview

Providing a safe and healthy environment of care for patients, employees, staff and visitors. Department heads, supervisors and managers are responsible for ensuring compliance with hospital policies regarding the environment of care. Employees are responsible for working in a manner which ensure a safety and healthy environment for patients, visitors and coworkers.

Risk Assessment – Standards of Performance

- ❖ Risk assessment and hazards surveillance rounds to be conducted semi annually.
- ❖ Employees working in patients care building to be interviewed quarterly regarding safety/ health/ environmental policies and procedures with a minimum acceptable average correct response rate of 90% and a goal of greater than 95%.

- Grounds and equipment to meet, a minimum, the requirements of regulatory/ advisory groups with respect to health care facilities and equipments, deficiencies to be corrected in a timely manner.
- All employee injuries/ illness to be reviewed, monitored and evaluated. Trends to be identified. Corrective actions to be taken as needed.
- Patient incidents to be reviewed, monitored and evaluated. Trends to be identified. Corrective actions to be taken as needed.
- Department safety training to be given.
- Departmental safety policies and procedures to be reviewed at least every 3 years.

Information Gathering and Reporting

Results are shared quarterly or more frequently if needed, with the Hospital Safety Committee and Hospital Executive Office. Departments are notified as needed. Quarterly summary reports are submitted to be governing board of the hospital authority.

Orientation and Training Programmes

Hospital supports an on-going program of new employee safety orientation and training and annual refreshers thereafter. Worker knowledge is assessed during hazard surveillance and safety rounds and during annual refreshers. Specific responsibilities are:

- Human Resources – New employee orientation coordination
- Safety Office – Facilitate institution-wide safety training opportunities
- Departments/ Units – Provide department specific training
- Hospital Executive Office – Facilitate training opportunities.

Organisation Roles and Responsibilities

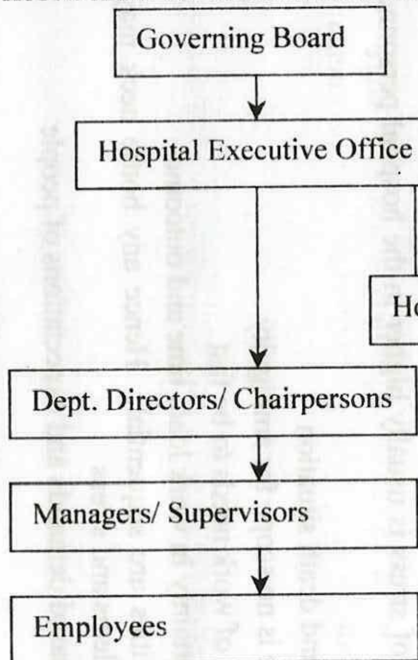
Risk assessment and hazard surveillance rounds to be conducted quarterly by the hospital safety committee. The data is tabulated by the Hospital Safety Officer and evaluated by the Hospital Safety Committee to identify strengths and deficiencies in order to minimise or eliminate hazards and improve performance.

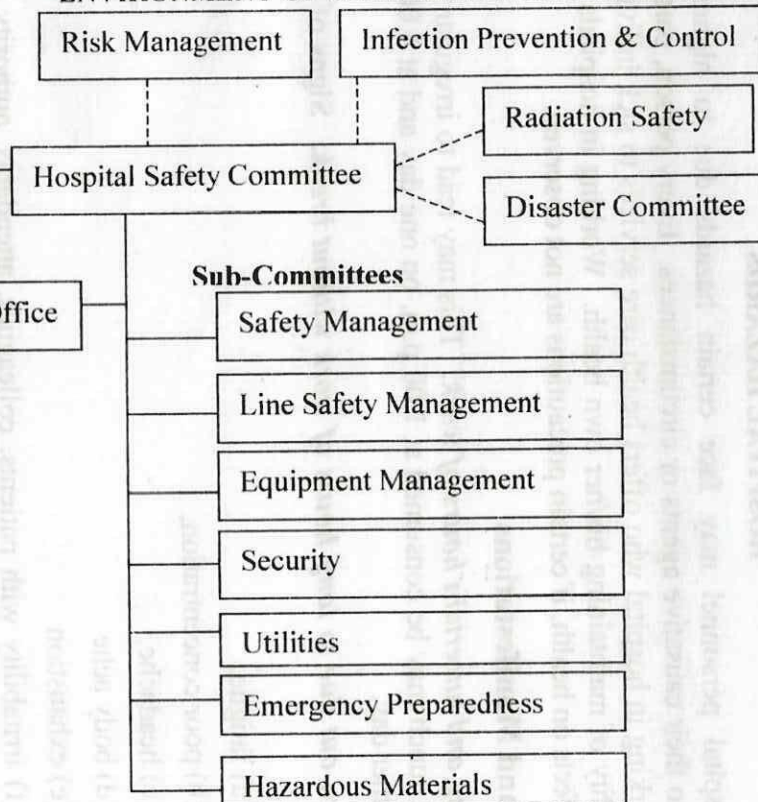
Worker injuries and illnesses data to be collected and reviewed. Incident data to be collected and reviewed by risk management. Buildings and grounds are maintained by facilities management and landscape.

The specific charge to the Hospital Safety Committee is:

- Initiate and coordinate a hospital-wide safety program.
- Review summaries of incident reports and recommend and ensure completion of corrective actions as needed.
- Review quarterly reports regarding life safety compliance fire drill reports which summarizes employees and staff performance.
- Scheduling of required safety checks and preventive maintenance of electrically and non-electrically powered patient care equipment and electrically powered, line operated non-patient care equipment.
- Proper operation and malfunction of utility systems.
- Hazards material management.
- Security reports.
- Emergency preparedness reports.
- Conduct quarterly risk assessment and hazard surveillance rounds: review the data to identify trends and recommend and ensure completion of action as needed.
- Facilitate review of departmental safety plans to ensure that safety policies, procedures and training appropriate to departmental activities are in place.
- Facilitate employee orientation and training programs.

HOSPITAL MANAGEMENT OF THE ENVIRONMENT OF CARE





HOSPITAL HAZARDS

Hospital personnel may face certain hazards due to higher risk of exposure to their causative agents or circumstances. Every person, particularly a person working in hospital who offers health care services to sick individuals has responsibility of maintaining his/her own health. Working in hospitals can have adverse effects on health, if certain precautions are not observed.

Reasons and Manifestations

- ***Long and uncertain hours of work:*** This may lead to irregular life style. E.g. lunch may be consumed at 1.00 p.m. on one day and at 4.00 p.m. on another day.
- ***Burn out due to long hours of work without break:*** Signs of burn out are:
  - (a) fatigue,
  - (b) poor concentration,
  - (c) headache,
  - (d) body ache
  - (e) exhaustion
  - (f) irritability with patients, colleagues, attendants, authority and also family members.
- ***Shift duties:*** Shift duties and long hours of work tend to disrupt biological clock. If the timings are changed too frequently body does not get sufficient time to get adapted resulting in poor health.
- ***Stress:*** Level of stress is usually higher in the hospital personnel as they deal with
  - (a) life and death situation
  - (b) there is no scope for ambiguity
  - (c) pace of work needs to be fast
  - (d) uncertainty in work load, time and outcome
  - (e) activities are sequential. Hence any bottle neck may lead to problems and stress
  - (f) increased demands and expectations of people

(g) competition

(h) higher incidence of conflicts.

Manifestations of stress are:

- altered appetite which may be poor or excessive
- acidity
- peptic ulcer
- constipation
- diarrhea – colitis
- headache
- giddiness
- hypertension
- higher risk of myocardial infarct
- body ache
- joint pains
- poor memory
- emotional changes like irritability, depression and emotional liability
- poor work output

❖ Hazards of exposure to (i) chemical agents (ii) infections (iii) physical harmful factors.

✓ Chemical agents: Exposure to chemical fumes may cause irritation of throat, irritation of eyes, trigger an attack of asthma, affect bonemarrow i.e., depression of marrow. Accidental spilling or spurting can cause chemical burns, injury to eyes, finger contamination and poisoning.

✓ Infections: Due to direct and indirect contact with biological fluids, blood or with the items used on patients with infection, hospital staff may acquire infection from the patients. Infections commonly seen are tuberculosis, HIV infection by needle stick injury or handling blood and blood products without taking precautions, or handling contaminated instruments. Hepatitis-B infection occurs in the same way as HIV infection. Pyogenic

infection due to finger cuts or other injury coming in contact with infecting agents can also occur.

✓ Physical harmful factors: There can be scalds or burns due to hot water/ needles or scalpel, electric shock while handling defective equipment. Hard flooring of hospital can cause backache if long distance if long distance needs to be walked. Foot problems like painful heels and falls are also common.

- Higher risk of drug addiction – due to easy access.
- In specialty like anesthesia, higher chances of hair loss, miscarriages and hepato toxicity.
- In radiology department exposure to excess radiation may cause anemia, agrannulocytosis, radiation overdose, higher risk of cancer and higher risk of congenial malformations of new born baby, if pregnant woman is exposed to radiation.
- Higher risk of facing litigations.

Prevention

1. Consciousness about health
2. Take safety precautions i.e. nutritious diet, regular sleep, exercise, rest and precautions against exposure to infection by routine use of gloves and taking universal precautions.
3. Good maintenance of electrical wiring, switch boards etc. Not touching these items with wet hands.
4. Proper posture to prevent backache.
5. Avoidance of exposure to (a) radiation – by using lead apron and gloves (b) infection by taking universal precautions.
6. Proper scheduling of work and effective time management.
7. Managing stress by (a) reducing stress level (b) increasing coping ability.

Review Questions:

1. Define hospital hazard management.
2. What are the responsibilities of the manager in hazard management?
3. Define risk assessment.
4. Explain the purpose and objectives of hospital hazard management plan.
5. How to assess the standards of performance in risk and hazard surveillance?
6. Explain hospital hazards for hospital persons.

*   *   *

UNIT – 3

HOSPITAL RELATED INFECTION

There is constant danger of patients admitted into the hospital getting infection while in the hospital. Such infections are known as nosocomial infections. They invariably prolong the length of hospital stay (on an average seven days). The incidence of nosocomial infection varies

- from one hospital to another
- with the primary disease condition of the patient, and
- with the nature of treatment.

Causes

The causes of such infections are:

Endogenous

When the infection (micro organisms) is derived from the patient's own body, it is termed as 'opportunistic infection'. It occurs as a consequence of –

- Debiliated condition of the patient
- Extremes of age – very young and ole
- Compromising the person's immune system (genetically, by disease, or following immunosuppressive therapy)
- Breach of the individual's skin/mucous membrane barrier (following severe burns, widespread dermatomes, surgical wounds, catheterization, incubation
- Following diagnostic/ treatment procedure (e.g. pulmonary infection developing in a patient on respirator)
- Secondary to malignant disorders, diabetes mellitus
- Prolonged broad-spectrum antibiotic therapy.

Exogenous

When the source of infection is external, it is referred as 'cross-infection'. This occurs as a result of:

- Improper asepsis of environment, equipment, instruments

- Poor sterilization/ disinfection techniques
- Invasive monitoring and therapeutic procedures
- Transmission of infection by staff carriers
- Consumption of infected food/ water
- An epidemic arising in the community and spreading to the hospital

The highest incidence of nosocomial infection occurs amongst patients subjected to invasive technology in vulnerable areas such as critical care and premature nurseries. Urinary tract infections constitutes about 40 percent of all nosocomial infections. Next in frequency comes respiratory, surgical wound and blood stream (bacteremia) infections.

Prevention of Hospital Related Infections

1. The greatest single factor in the spread of nosocomial infections is the failure of medical care workers to wash their hands often enough. Conscientious washing of hands between patient contacts effectively prevents most of the cross-infections which tend to occur between patients.
2. Adequate disinfection of the environment and provision of properly sterilized materials for all diagnostic and treatment procedures is a necessity. Sterilization of instruments and consumables is more effective when carried out in a Central Sterile Supply Department (CSSD). Use of pre-sterilized packs, disposables and routine disinfection of ward, equipment, furniture, linen etc. is important in preventing nosocomial infection.
3. Adhere strictly to aseptic techniques while performing various surgical and instrumentation procedures. These include:
   - A strict 'no touch' technique while changing surgical dressings, insertions or removal of a drain, catheterization etc.
   - Use of adequately sterilized packs.
   - Periodical removal and reinsertion of sterilized catheters, drains etc.
   - Proper handling of catheter and suction tubes and related equipment.
4. Segregate contaminated instruments; keep them aside for disinfection, clearing, repacking and resterilization. Infected materials should be discarded and incinerated wherever possible. Soiled infected linen should be sluiced, washed separately using steam and sterilized. Sputum cups to be

incinerated (if disposable) or disinfected and autoclaved. Bedpans and urinals to be washed and disinfected between uses.

5. Isolation facilities and procedures must exist in critical care areas (intensive care unit, newborn nursery, burns unit etc), both for patients with communicable infections (source isolation) and for those who are particularly vulnerable to infection (protective isolation).
6. Indiscriminate and inappropriate use of antibiotics should be thoroughly discouraged as this leads to spread of drug-resistant strains of bacteria. The following guidelines may be considered in determining an antibiotic policy:
   - Use of antibiotics only when clearly indicated
   - Use of antibiotics in adequate dosage, for sufficient period of time.
7. Precautions with staff: Immunise staff periodically against typhoid, and, if possible, against other common infections such as hepatitis-B. Screening of staff working in dietary and canteen is essential to rule out carriers of organisms causing amoebiasis, typhoid and diarrhoeas. Monitor personnel employed in high-risk areas bacteriologically.
8. Surveillance of nosocomial entails an ongoing scrutiny of hospital patients and procedures to determine the types of nosocomial infections occurring, and why and how they are occurring. It requires active follow-up of specific infections in terms of morbidity and mortality in time and place, keeping track of the sources and spread of the infecting agent, and the study of conditions that may favour or inhibit the spread of infection in the hospital.

ROLE OF THE CENTRAL STERILE SUPPLY DEPARTMENT (CSSD)

The Central Sterile Supply Department (CSSD) is now an accepted feature of hospital planning. With a CSSD set-up, nursing time is saved, sterilization processes are more effectively controlled, aseptic techniques are safer and can be standardized throughout the hospital. These contribute to reduction in incidence of hospital infection.

Functions of CSSD

- Supply of sterile instruments and materials for dressings and procedures carried out in wards and departments.

- Sterilization of instruments and linen for use in the operation theatre.
- The CSSD may also look after:
  - Disinfection and sterilization of medical and nursing equipment such as ventilators, baby incubators, oxygen tents etc.
  - Selection and distribution of single-use (disposable) sterile supplies such as catheters, suction tubing and syringes.

Working Principles of CSSD

The salient working principles of the CSSD to ensure adequate control of cross-infection are responsibility for the supervision of sterilizing tasks should be clearly defined, clearly understood, undivided and vested in the CSSD in-charge, who is invariably a trained nurse. She may report to the Microbiologist, Infection Control Officer, Nursing Superintendent and/or Medical Superintendent.

There are three categories of articles to be dealt with in CSSD – contaminated, clean and sterile.

- ✓ ***Contaminated*** and potentially contaminated articles are those instruments and reusables which are used for a procedure and which may be contaminated by bacteria. Such articles require to be kept aside, washed and thoroughly cleansed.
- ✓ ***Clean*** articles include those items which have been cleansed as also those reusables which have been exposed though not used for a procedure, date-expired packs and new items that have not yet been sterilized.
- ✓ ***Sterile*** items are those that have undergone the sterilization process through autoclaving, gas sterilization, gamma irradiation etc. and which are free of vegetative forms and spores.

There should be no scope for these three types of articles to get mixed together. Contaminated articles should always be kept separate from clean goods and sterile supplies. Sterile supplies and contaminated articles should not be carried on the same trolley at the same time.

The CSSD pay attention to the proper direction of work flow and economy of labour. Articles should move only in one direction through receipt, washing, drying, sorting, checking, reassembly and packing, sterilization, and

storage for reuse. Careful and logical workflow should ensure that clean packs awaiting sterilization can at no time become confused with sterile supplies.

The CSSD should deliver all sterile supplies to users, and should also undertake collection of contaminated articles.

Machines often provide more satisfactory and economical solutions in CSSD than manual work. It is necessary to address the following issues:

- Can the task be more efficiently done by hand or by a machine?
- Is the task an unpleasant one?
- Is the volume of the task great enough to justify the cost of mechanical equipment?

Location of CSSD

CSSD may preferably sited close to the operation theatre and wards. If it is located in the basement under the ward blocks it serves, enable the delivery and receipt of materials through hoists or dumb-waiters .

In planning a CSSD, the following concepts may be kept in mind:

- Space: about 4 sq.feet per bed.
- The following rooms should find place in CSSD:
  - Wash room in which everything is washed up
  - Work room in which all packaging is undertaken
  - Syringe and Instrument processing room
  - Unsterile Pack Store
  - Bulk Store
  - Sterile Store
  - Miscellaneous rooms, including glove room, office, rest room, lavatories etc.
  - Autoclaves

The colours chosen for the department should contribute to its quiet efficiency. White background is suggested for ceilings and walls, white for woodwork, grey for bench surfaces and floorings. Doors should have the following strong colours to signify the different zones to which they give access:

- red denotes a contaminated zone

- yellow a clean zone
- green sterile zone

These colours brighten the department and act as continual reminders to the staff, when they enter a room, of the type of work on which they will be engaged.

Monitoring and Control of Cross Section

1. It is necessary to monitor the prevalence of cross infection and initiate eradication and control measures whenever an outbreak or epidemic of nosocomial infection is threatened or is evident.

2. Monitoring is done by:

   - Periodical review of statistics of hospital-acquired infections as reported in the medical records of patients and as compiled by the Medical Records Department or by the Infection Control Officer.
   - Ensuring that all cases of suspected cross-infection are reported to the Medical Superintendent by the attending physician/ nurse.
   - Such intimations serve to alert the hospital administration regarding the increased incidence of cross-infection in any particular area of the hospital, to trace the source of such infection, and to take suitable measures to control it.
   - The Microbiology Department plays a major role in collection and analysis of laboratory data on nosocomial infection. Through review of bacteriological counts and culture and sensitivity studies of routine swabs taken of the environment and appliances in critical areas of the hospital, it is possible to obtain a clear picture of the endemic prevalence of micro organisms responsible for hospital-acquired infections. Further, the Microbiology Department, through review of culture and sensitivity reports of specimens sent from patients in a particular ward, can identify the existence of such infection. The hospital administration and the relevant doctors/ ward incharge can be altered and further studies undertaken to determine the source of infection, identification of the organism, antibiotic sensitivity, phage or stereotype etc.

3. Depending on the nature of the microorganism, the source of infection, mode of transmission and severity of the infection, it may be necessary to:
   - Modify the manner of carrying out a certain procedure, e.g. type of sterile pack used, preference for disposable material versus reusable, choice of a different chemical disinfectant or mode of sterilization, use of gloves or other aseptic techniques, adequate disposal of contaminated materials etc.
   - Isolate patients with the particular infection to limit the spread of such infection and use barrier nursing techniques, and
   - Disinfect the environment by fumigation/ formalin aerosol.

Staff Health

Disease transmission can occur from and to persons who have direct contact with patients – doctors, nurses, paramedical workers and others. Infection control objectives should focus on –

✓ Maintenance of sound habits of personal hygiene and individual responsibility in infection control.

✓ Monitoring and investigating infections, diseases and potentially harmful exposures; and

✓ Instituting appropriate preventive measures.

Review Questions:

1. Explain the causes for the hospital acquired infection.
2. How will you prevent hospital acquired infections?
3. Describe the role of Central Sterile Supply Department.
4. Explain the process of monitoring and control of cross-infection.

* * *

UNIT – 4

BIO-MEDICAL WASTE MANAGEMENT

One of the main causes for spread of infections and disease is the improper disposal of waste. It is a health hazard for hospital employees, patients and society. Hospital employees come in close contact with infected tissues, biological fluids, and infected materials of patients. Similarly, the doctors, nurses, labour staff and technical staff working in laboratories face the risk of accidental infection. As far as patients are concerned, there is a possibility of cross infection and hospital related infection.

It has been observed that many hospitals and nursing homes dump all the waste at the garbage collection site from where garbage is taken away by the vehicles for final disposal. Most of the sites are vanished by rag pickers who may get infected while handling infected items. The items picked up are often cleaned and sold in the market by them, e.g. used needles, syringes, gloves, discarded drugs etc. Those who use these items face the risk of infection.

The Ministry of Environment and Forest has specified the guidelines for handling and disposing biomedical waste. These guidelines stress on:

a) Segregation
b) Storage
c) Disinfection
d) Disposal

Terminologies in Biomedical Waste

For describing biomedical waste, different terminology is used.

a) ***Biomedical Waste:*** Indicates waste material which is generated during (i). diagnosis, (ii) treatment, (iii) immunizations, (iv) research, (v) slaughtering of animals, (vi) veterinary practices.

b) ***Medical Waste:*** It means any waste which is generated in (i) diagnosis, (ii) treatment of human beings, (iii) immunizations, (iv) diagnosis, (v) treatment of animals, (vi) research, (vii) production of biologicals, (vii) testing of biologicals.

c) ***Hospital Waste:*** It is the waste produced or coming out of the hospitals which may be:

   i. Non hazardous - about 85%

   ii. Infectious - about 10%

   iii. Hazardous - about 5%

d) ***Critical Waste:*** This waste is generated as a result of medical care in the (i) hospitals, (ii) nursing homes, (iii) diagnostic centers, (iv) laboratories, (v) domiciliary care i.e., care given at home.

e) ***Pathological Waste:*** This includes (i) human tissues, (ii) human organs, (iii) human body parts, (iv) human body fluids, (v) containers which carry above items during surgery, other medical procedures, autopsy, anatomy dissection.

f) ***Infectious Waste:*** It means any waste which can transmit: (i) bacterial infection, (ii) viral infection, (iii) parasitic infection, (iv) infected animal waste is also included in this category.

g) ***Hazardous Waste:*** This waste is hazardous, but not infectious. It includes (i) radioactive substances, (ii) chemicals – liquid, gaseous, vapours, (iii) pharmaceutical waste – cytotoxic drugs, outdated drugs etc.

Classification of Biomedical Wastes

World Health Organisation has classified biomedical wastes into the following categories:

1. ***General Wastes:*** All nonhazardous, domestic wastes, e.g. peels of vegetables, fruits; papers, packing material etc.

2. ***Pathological Wastes:*** Which include – tissues, organs, body parts, human foetus, products of conception – abortus, animal carcasses, blood, body fluids.

3. ***Radioactive Waste:*** This includes – solids, gases, liquids resulting from analysis, procedures, body organs, imaging, tumour localisation, treatment.

4. ***Chemical Waste:*** This may be hazardous or non hazardous. Hazardous material which is toxic, corrosive, flammable, reactive, genotoxic (can

alter genetic material), teratogenic (can cause congenital malformations). Non hazardous, e.g. antiseptics.

5. ***Infectious Waste:*** This waste contains pathogenic organisms in sufficient quantity and therefore pose a threat of serious infection. These items are–
   - cultures from laboratories,
   - waste from surgery, i.e. removal of infected tissues,
   - autopsy on patient with infectious disease,
   - waste from patients in isolation wards,
   - waste from patients undergoing haemodialysis,
   - waste associated with infected animals.
6. ***Sharps:*** The items which can cause a cut or puncture. Eg. Needles, blades, broken syringe, glass pieces etc.
7. ***Pharmaceutical Waste:*** Certain items in the drug industry or in hospitals can be harmful. Eg. Degraded raw materials, by product, outdated drug, contaminated drug, spilled drug or chemical.
8. ***Pressurized containers and aerosols***.

HAZARDS AND RISKS

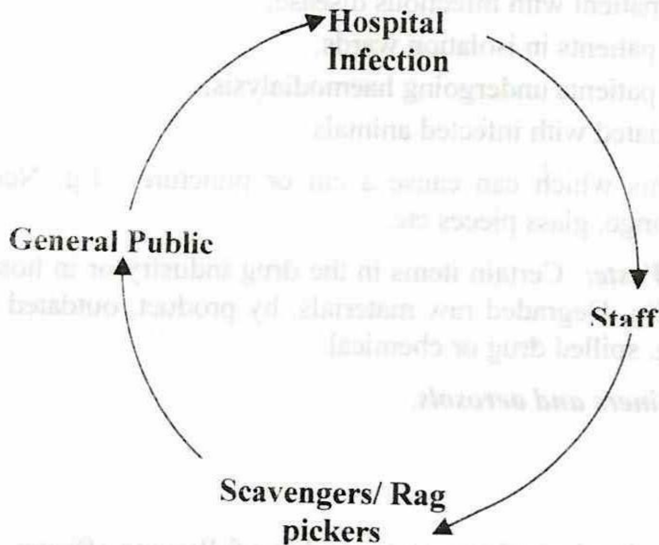
Exposure to infected or hazardous waste can have following effects:

- **Increased Risk of Infection:** These infections can result from – handling without gloves, injury with infected sharp, inhalation. Ordinarily pyogenic infections are seen due to injuries or use of infected injection needles used by unethical individuals and drug addicts.
- **Increased Risk of HIV Infection:** It is believed that HIV is a labile virus and it gets quickly inactivated. Though HIV does not survive for a long time and is destroyed by heat and certain chemicals, the virus can survive for a longer time within the needle or the syringe, if they are not washed. Injury by infected sharp can cause HIV infection in – hospital staff, rag pickers, general public, if the garbage disposal methods are improper.
- **Risk of Hepatitis-B Virus Infection:** The infection following same pattern as HIV. However Hepatitis-B virus can survive for a much longer

time. It has been reported by a study conducted in Japan that both HIV and Hepatitis-B virus can survive in an infected syringe in the infective dose for about 8 days after its use on an infected patient.

- **Poisoning:** Contamination with chemical waste can cause poisoning due to accidental ingestion of contaminated items or by the item coming in contact with oral mucosa.

Hazardous and Risks can be diagrammatically shown as follows:



MODE OF INFECTION

There are different ways by which the infection enters the body:

1) **Injury on the Job:** Eg. Accidental needle injury, cut on finger coming in contact with infection.
2) **Negligence:** Not taking routine precautions while handling potentially infected or infected material, e.g. not using protective gloves while handling patients, during autopsy or transporting garbage.
3) **Ignorance:** Not knowing about the consequences of handling infected material or patient. Handling patients without due precautions can cause infection – not using gloves, while handling infected patient or material

because the risk of infection is not known. Eg. Poorly informed labour staff, scavenger, attendant of the patients can be at risk due to ignorance.

At times treating team is not aware that the patient has HIV or Hepatitis-B virus infection. Under such circumstances if the precautions are not observed or if there is accidental contamination by body fluid of the patient, infection enters the body. It is therefore essential to take universal precautions to prevent infection and presume that every patient can be potentially infective.

Items like used syringes, discarded gloves, plastic tubings are illegally sold by the rag pickers. These items may be used for domestic purpose without realizing the risk involved. Eg. Children playing with used condoms by inflating them like balloons. This behaviour exposes child's oral mucosa directly to the material of condom.

4) **Drug Addicts:** Drug addicts abusing injectable substances are likely to acquire used syringes directly from the garbage disposal site or may purchase the same from grey market. This behaviour exposes them to higher risk of infection.

5) **Rag Pickers:** Almost all the garbage dumping sites are regularly visited by the rag pickers who try to scavenge the items which could be sold, e.g. gloves, needles, syringes, tubings, used oxygenators, polythene bags, boxes etc. If the garbage is not segregated, it is bound to contain infected sharp and other infected items. This can lead to infection of rag pickers. Rag pickers are also responsible for spreading the infection to general public. Presence of security staff at garbage dumping site is therefore necessary.

6) **Reuse of Disposable Items:** Inspite of manufacturer's instructions like 'for single use only' or 'do not resterilize' many departments and hospitals reuse disposable items after sterilization. If the items like needles, syringes, fine catheters are not properly cleaned or properly sterilized, there is risk of infection. Even when these items have been discarded by the users after one use, they may be picked up by labour staff or scavengers and put back in the circulation. It is argued that poor countries should reuse disposable items after resterilizing them. If that is the policy adopted by the hospital, following points must be clarified:

- Method of sterilization to ensure safety
- Number of times each item can be reused
- Responsible person verifying the safety of reuse
- Consent of the patient in writing after informing about the reuse.

DISPOSAL OF BIOMEDICAL WASTE

For safe and effective disposal of waste generated in hospitals, following principles are followed:

1. Segregation
2. Disinfection
3. Storage
4. Transport
5. Final disposal

Segregation

There is general tendency to throw all the garbage and waste in the same container. This behaviour results in mixing up of infected waste, noninfected domestic waste, sharps etc. If this mix up is not avoided, entire mixture has to be considered as infected waste. The cost of treatment and disposal of this waste goes up due to larger bulk.

Advantages of Segregation

- General waste does not become infectious
- Segregation reduces chances of infection of staff
- Treatment cost comes down
- Non-infected waste can be recycled.

Segregation is carried out at the site of waste generation, i.e. a) Wards b) Operation theatres, c) ICUs, d) Stores, e) Pharmacy, f) Laboratories, g) Autopsy room etc.

For easy identification of different types of waste, specific colour code is followed:

a) ***Yellow:*** Yellow plastic bags are used for segregating (i) human anatomical waste, (ii) dissected parts, (iii) tissue removed at surgery, (iv)

aborted fetus, (v) laboratory cultures, (vi) laboratory specimen, (vii) items contaminated with blood or body fluids, i.e. dressing material, cotton, bandages etc. (viii) animal tissue (used in experimental laboratory).

Methods of disposal: a) incineration, b) deep burial.

b) ***Red:*** Red plastic bag or disinfected container is used for segregating (i) laboratory waste, (ii) culture plates, (iii) items contaminated with blood, (iv) non sharp disposable items like gloves, catheters, tubings, intravenous sets etc.

Method of disposal: Catheters, tubings etc. are shredded to prevent reuse. After shredding they are disinfected by autoclaving, microwaving or using chemicals. Finally they are sent for incineration.

c) ***Blue or White Translucent Plastic Bag:*** Puncture proof container like empty cans or thick cardboard boxes, translucent plastic bags of blue or white colour are used to store sharp items like (i) needles, (ii) syringes, (iii) scalpel blades, (iv) broken glass items.

Other items which can be sent in the above mentioned bags are disposable, tubings, colostomy bags, feeding tubes etc.

Methods of disposal: After shredding these items either autoclaving or microwaving chemical treatment is carried out. The waste then is sent for deep burial or incineration.

d) ***Black:*** Black plastic bags are used to segregate (i) discarded medicines, (ii) cytotoxic drugs, (iii) chemicals which have been used for disinfection, (iv) insecticides, (v) incineration ash.

Method of disposal: Disposal in secured land fill.

e) ***Liquid:*** This waste is disinfected and discarded in drains.

f) ***Radioactive waste:*** This waste is hazardous. It is stored in lead containers in the basement of hospital building for 3 to 6 weeks for the radio activity to disappear. After this period it is discharged in drains.

Disinfection

To render infectious items free from pathogenic organism disinfection is carried out before transporting and disposing them.

Methods of Disinfection

- Thermal: This disinfection can be dry or wet (autoclaving)
- Chemical: i) Using formaldehyde, ii) Sodium hypochlorite, iii) Ethylene oxide, iv) Bleaching powder.
- Irradiation and exposure to ultraviolet rays.
- Use of Microwave: Small microwave is used for small quantities of laboratory waste. Large units are required for larger quantities of waste. Large units incorporate: i) Grinding, ii) Steam spraying, iii) Microwave irradiation.

Storage

Until adequate quantity accumulates, waste needs to be stored at the site where it is generated. It is necessary to use coloured bags and also label them. Waste bags or containers are carried to specific local storage place. It is necessary to have security at this place to prevent unauthorised persons and rag pickers handling waste material. If the hospital has its own disposal site i.e. incinerator, the waste can be sent there by proper garbage trolleys.

Treatment of Waste

Treatment of waste is the process which modifies the waste in some way before it is taken to its final resting place. It can be a) disinfection, b) baling and size reduction and c) shredding to make recyclable item unusable breaking tip of the syringe, needles etc.

Transport

Transportation of garbage can be within the hospital, i.e. internal and from hospital to final disposal site i.e. external.

Internal Transport

From different areas, segregated waste bags are sent to the dumping place of the hospital. Trolleys/carts used for transporting garbage should not be used for any other purpose. Persons carrying garbage should wear disposable plastic gloves. If there is shortage of such gloves, ordinary plastic bag can be used to cover and protect hands. Spillage must be avoided.

External Transport

From the hospital dumping place waste may need to be taken to appropriate place for a) incineration, b) land fill, c) vermiculture etc. It should not be mixed with general garbage. Vehicles carrying hospital waste should not carry general municipal garbage.

Final Disposal

Final disposal of waste depends on its category. Noninfectious waste like papers can be recycled. Biodegradable waste can be used for land fill, vemiculture, or just buried. Infectious solid waste is incinerated. Infectious liquid waste is disinfected and flushed out or discharged in the drains.

MANAGEMENT ISSUES

Almost any system of disposal can be operated by well trained staff. Following measures are useful.

a) **Attitudinal Change:** Management of hospital waste requires diligence and care from a chain of people starting with nurse, doctor, labour staff, persons transporting waste, persons handling mechanical and technical aspect. If need for safe disposal is stressed, cooperation for segregation, storage, disinfection etc. will not be difficult.

b) **Training and Motivation:** Those who handle garbage are often not aware of the risk and hazard of the activity. They are also not aware of the importance of their contribution. Training of the staff is therefore necessary.

c) **Responsibility:** It is desirable to specify job responsibility. If there are failures or problems, proper communication will sort out the same and decide on better alternatives.

d) **Occupational and Pricing:** Steps required for safe disposal of hospital waste require some expenditure. If proper system is evolved and implemented the cost of safe disposal works out to be 0.1% to 0.2% of the total running cost of the hospital. Saving on this activity is of little significance in proportion to total expenditure.

e) **Surveillance:**

- It is necessary to monitor the entire process.

- Hospital infection control committee should actively carry out surveillance.
- Monitoring of accidents, injuries and infections is necessary.
- Staff handling waste should have regular medical check up.
- Rag pickers cannot be easily eliminated, at lease in poor countries. Therefore following steps can be taken to help rag pickers:
    - Emphasis on dangers of handling infected waste and recycling.
    - Training rag pickers in acquiring recyclable waste.
    - Public awareness about segregation of waste and role of rag picker's activities, must be created.
    - Establishment of linkages between formal system and rag pickers.
    - Medical assistance and health education for rag pickers and their families.
    - General public must be convinced about – reducing the quantity of garbage by utilizing reusable and recyclable items.

INCINERATION

Refuse can be disposed of hygienically by burning or incineration. It is the method of choice where suitable land is not available. Hospital refuse which is particularly dangerous is best disposed of by incineration. Incineration is practiced in several of the industrialized countries, particularly in large cities due to lack of suitable land. Incineration is not a popular method in India because the refuse contains a fair proportion of fine ash which makes the burning difficult. A preliminary separation of dust or ash is needed. All this involves heavy outlay and expenditure, besides manipulative difficulties in the incinerator. Further, disposal of refuse by burning is a loss to the community in terms of the much needed manure. Burning, therefore, has a limited application in refuse disposal in India.

Tamil Nadu Pollution Control Board – Rules and Regulations

In exercise of the powers conferred by Section 6, 8 and 25 of the Environment (Protection) Act, 1986 the Central Government hereby notifies the rules for the management and handling of bio-medical waste.

1. Short title and Commencement

These rules may be called the Bio-Medical Waste (Management and Handling) Rules, 1988 and Bio-Medical Waste (Management and Handling) (Amendments) Rules, 2000. They shall come into force on the date of their publication in the official Gazette.

2. Notification

The rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle bio-medical waste in any form.

3. Definitions

In these rules unless the context otherwise requires,

Act means the Environment (Protection) Act, 1986 (29 of 1986).

Authorisation means permission granted by the prescribed authority for the generation, collection, reception, storage, transportation, treatment, disposal and/or any other form of handling of biomedical waste in accordance with these rules and any guidelines issued by the Central Government.

Authorised Person means an occupier or operator authorized by the prescribed authority to generate, collect, receive, store, transport, treat, dispose and/or handle biomedical waste in accordance with these rules and any guidelines issued by the Central Government.

Biomedical Waste means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production of testing of biologicals, and including categories mentioned in Schedule.

Biologicals means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use

in the diagnosis, immunization or the treatment of human beings or animals or in research activities pertaining thereto.

Biomedical Waste Treatment Facility means any facility wherein treatment disposal of biomedical waste or processes incidental to such treatment or disposal is carried out.

Occupier in relation to any institution generating biomedical waste, which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called, means a person who has control over that institution and/or its premises.

Operator of a Biomedical Waste Facility means a person who owns or controls or operates a facility for the collection, reception, storage, transport, treatment, disposal or any other form of handling of biomedical waste.

Schedule means schedule appended to these rules.

4. Type of Occupier

Shall be the duty of every occupier of an institution generating biomedical waste which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called to ensure that such waste is handled without any adverse effect to human health and the environment.

5. Treatment and Disposal

Biomedical waste shall be treated and disposed of in accordance with Schedule I, and in compliance with the standards prescribed in Schedule V.

Every occupier, where required, shall set up in accordance with the time-schedule in Schedule VI, requisite biomedical waste treatment facilities like incinerator, autoclave, microwave system for the treatment of waste at a common waste treatment facility or any other waste treatment facility.

6. Segregation, Packaging, Transportation and Storage

Biomedical waste shall not be mixed with other wastes.

Biomedical waste shall be segregated into containers/bags at the point of generation in accordance with Schedule II prior to its storage, transportation, treatment and disposal. The containers shall be labeled according to Schedule III.

If a container is transported from the premises where biomedical waste is generated to any waste treatment facility outside the premises, the container shall, apart from the label prescribed in Schedule III, also carry information prescribed in Schedule IV.

Not withstanding anything containing in the Motor Vehicles Act, 1998 or rules thereunder, untreated biomedical waste shall be transported only in such vehicle as may be authorized for the purpose by the competent authority as specified by the Government.

No untreated biomedical waste shall be kept stored beyond a period of 48 hours.

Provided that if for any reason it becomes necessary to store the waste beyond such period, the authorized person must take permission of the prescribed authorized person must take permission of the prescribed authority and take measures to ensure that the waste does not adversely affect human health and the environment.

Provided that the authority may entertain the appeal after the expiry of the said period of thirty days if it is satisfied that the appellant was prevented by sufficient cause from filling the appeal in time.

7. Prescribed Authority

- The Government of every State and Union Territory shall establish a prescribed authority with such members as may be specified for granting authorization and implementing these rules. If the prescribed authority comprises of more than one member, a chairperson for the authority shall be designated.
- The prescribed authority for the State or Union Territory shall be appointed within one month of the coming into force of these rules.
- The prescribed authority for the State or Union Territory shall be appointed within one month of the coming into force of these rules.
- The prescribed authority shall function under the supervision and control of the respective Government of the State or Union Territory.
- The prescribed authority shall function under the supervision and control of the respective Government of the State or Union Territory.

- The prescribed authority shall function under the supervision and control of the respective Government of the State or Union Territory.
- The prescribed authority shall on receipt of Form I make such enquiry as its deems fit and if it is satisfied that the applicant possesses the necessary capacity to handle bio-medical waste in accordance with these rules grant or renew an authorisation as the case may be.
- An authorization shall be granted for a period of three years. including an initial trial period of one year from the date of issue. Thereafter, an application shall be made by the occupier/ operator for renewal. All such subsequent authorization shall be for a period of three years. A provisional authorization will be granted for the trial period, to enable the occupier/ operator to demonstrate the capacity of the facility.
- The prescribed authority may after giving reasonable opportunity of being heard to the applicant and for reasons thereof to be recorded in writing, refuse to grant or renew authorization.
- Every application for authorization shall be disposed of by the prescribed authority within ninety days from the date of receipt of the application.
- The prescribed authority may cancel or suspend an authorization, if for reasons, to be recorded in writing, the occupier/ operator has failed to comply with any provision of the Act or these rules:

  Provided that no authorization shall be cancelled or suspended without giving a reasonable opportunity to the occupier/ operator of being heard.

The prescribed authority for enforcement of the provisions of these rules shall be the State Pollution Control Boards in respect of States and the Pollution Control Committees in respect of the Union territories and all pending cases with a prescribed authority appointed earlier shall stand transferred to the concerned State Pollution Control Board, or as the case may be, the Pollution Control Committees.

8. Authorisation

- Every occupier of an institution generating, collecting, receiving, storing, transporting, treating, disposing and/or handling biomedical waste in any other manner, except such occupier of clinics, dispensaries, pathological

laboratories, blood banks providing treatment/ service to less than 1000 patients per month, shall make an application in Form I to the prescribed authority for grant of authorization.

- Every operator of bio-medical waste facility shall make an application in Form I to the prescribed authority for grant of authorization.
- Every application in Form I for grant of authorization shall be accompanied by a fee as may be prescribed by the Government of the State or Union Territory.
- The authorization to operate a facility shall be issued in Form IV, subject to conditions laid therein and such other condition, as the prescribed authority, any consider it necessary.

9. Advisory Committee

The Government of every State/ Union Territory shall constitute an advisory committee. The committee will include experts in the field of medical and health, animal husbandry and veterinary sciences, environmental management, municipal administration, and any other related department or organization including non-governmental organizations. The State Pollution Control Board/ Pollution Control Committee shall be represented. As and when required, the committee shall advise the Government of the State/ Union Territory and the prescribed authority about matters related to the implementation of these rules.

10. Annual Report

Every occupier/ operator shall submit an annual report to the prescribed authority in Form II by 31 January every year, to include information about the categories and quantities of biomedical wastes handled during the preceding year. The prescribed authority shall send this information in a complied form to the Central Pollution Control Board by 31 March every year.

11. Maintenance of Records

Every authorized person shall maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal and/or any form of handling of biomedical waste in accordance with these rules and any guidelines issued.

All records shall be subject to inspection and verification by the prescribed authority at any time.

12. Accident Reporting

When any accident occurs at any institution or facility or any other site where biomedical waste is handling or during transportation of such waste, the authorized person shall report the accident in Form III to the prescribed authority forthwith.

13. Appeal

Any person aggrieved by an order made by the prescribed authority under these rules may, within thirty days from the date on which the order is communicated to him, prefer an appeal to such authority as the Government of State/ Union Territory may think fit to constitute.

STANDARDS FOR WASTE AUTOCLAVING

The autoclave should be dedicated for the purposes of disinfecting and treating biomedical waste.

1. When operating a gravity flow autoclave, medical waste shall be subjected to:
   - a temperature of not less than 121°C and pressure of 15 pounds per square inch (ps) for an autoclave residence time of not less than 60 minutes; or
   - a temperature of not less than 135°C and pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or
   - a temperature of not less than 149°C and pressure of 52 psi for an autoclave residence time of not less than 30 minutes.
2. When operating a vacuum autoclave, medical waste shall be subjected to a minimum of one pre-vacuum pulse to purge the autoclave of all air. The waste shall be subjected to the following:
   - a temperature of not less than 121°C and pressure of 15 psi for an autoclave residence time of not less than 45 minutes; or

- a temperature of not less than 135°C and pressure of 31 psi for an autoclave residence time of not less than 30 minutes; or

3. Medical waste shall not be considered properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time, temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time were achieved.
4. Recording of operational parameters: Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.
5. Validation Test: Spore Testing: The autoclave should completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be Bacillus Stearothermophilus spores using vials or spore strips, with atleast 1×10^4 spores per milli litre. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, regardless of temperature and pressure, a temperature less than 121°C or a pressure less than 15 psi.
6. Routine Test: A chemical indicator strip/ tape that changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different location to ensure that the inner content of the package has been adequately autoclaved.\

STANDARDS FOR LIQUID WASTE

The effluent generated from the hospital should conform to the following limits:

Parameters	Permissible Limits
pH	6.5 – 9.0
Suspended solids	100 mg/l
Oil and grease	10 mg/l
BOD	30 mg/l
COD	250 mg/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent

These limits are applicable to those hospitals which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the Environment (Protection) Act, 1986 shall be applicable.

STANDARS FOR MICROWAVING

- Microwave treatment shall not be used for cytotoxic, hazardous or radioactive wastes, contaminated animal carcasses, body parts and large mental items.
- The microwave system shall comply with the efficacy test/ routine tests and a performance guarantee may be provided by the supplier before operation of the unit.
- The microwave should completely and consistently kill the bacteria and other pathogenic organisms that is ensured by approved biological indicator at the maximum design capacity of each microwave unit. Biological indicators for microwave shall be Bacillus Subtills spores using or spores using vials or spore strips with atleast 1×10^4 spores per milli liter.

STANDARDS FOR DEEP BURIAL

- A pit or trench should be dug about 2 meters deep. It should be half filled with waste, then covered with lime within 50cm of the surface, before filling the rest of the pit with soil.
- It must be ensured that animals do not access to burial sites. Covers of galvanized iron/ wire meshes may be used.
- One each occasion, when wastes are added to the pit, a layer of 10cm of soil shall be added to cover the wastes.
- Burial must be performed under close and dedicated supervision.
- The deep burial site should be relatively impermeable and no shallow well should be close to the site.
- The pits should be distant from habitation, and sited so as to ensure that no contamination occurs of any surface water or ground water. The area should not be prone to flooding or erosion.
- The location of the deep burial site will be authorized by the prescribed authority.
- The institution shall maintain a record of all pit for deep burial.

SCHEDULE (See Rule 5)

CATEGORIES OF BIOMEDICAL WASTE

Category No.	Waste Category Type	Treatment and Disposal Option
Cat 1	Human anatomical waste (human tissues, organs, body parts)	Incineration @/deep burial
Cat 2	Animal waste (animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges, discharge from hospital, animal houses)	Incineration @/deep burial

Cat 3	Microbiology and biotechnology waste (wastes from laboratory cultures, stocks or specimens of micro organisms live or attenuated vaccines, human and animal cell used culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures	Local autoclaving/ microwaving/ incineration
Cat 4	Waste sharps (needles, syringes, scalpels, blades, glass etc. that may cause puncture and cuts. This includes both used and unused sharps)	Disincfection (chemical treatment @@/autoclaving/ microwaing and multilation/ shredding##
Cat 5	Discarded medicines and cytotoxic drugs (wastes comprising of outdated, contaminated and discarded medicines)	Incineration @/destruction and drugs disposal in secured landfils
Cat 6	Solid waste (items contaminated with blood, and body fluids including cotton, dressing, soiled plaster casts, lines, beddings, other material contaminated with blood)	Incineration @ autoclaving/ microwaving
Cat 7	Solid waste (wastes generated from disposable items other than the waste sharps such as tubings, catheters, intravenous sets etc.)	Disinfection by chemical treatment @@ autoclaving /microwaving and mutilation/ shredding ##
Cat 8	Liquid waste (waste generated from laboratory and washing clearing house-keeping and disinfecting activities)	Disinfection by chemical treatment @@ and discharge into drains.

Cat 9	Incineration ash (ash from incineration of any biomedical waste)	Disposal in municipal landfill
Cat 10	Chemical waste (chemicals used in production of biologicals, chemicals used in disinfection, as insecticides etc.)	Chemical treatment @@ and discharge into drains for liquids and secured landfill for solids.

Chemical treatment using atleast 1% hypochlorite solution or any other equivalent chemical reagent. It must be ensured that chemical treatment ensures disinfection.

Mutilation/ shredding must be such as to prevent unauthorised reuse.

There will not be chemical treatment before incineration. Chlorinated plastics shall not be incinerated.

SCHEDULE II (See Rule 6)

COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIOMEDICAL WASTES

Colour Coding	Type of Container	Waste Category	Treatment options as per Schedule I
Yellow	Plastic bag	Cat 1, Cat 2 & Cat 3, Cat 6	Incineration/ deep burial
Red	Disinfected container/ plastic bag	Cat 3, Cat 6, Cat 7	Autoclaving/ Microwaving/ Chemical treatment
Blue/ White Translucent	Plastic bag/ puncture proof container	Cat 4, Cat 7	Autoclaving/ Microwaving/ Chemical treatment and destruction/ shredding
Black	Plastic bag	Cat 5, Cat 9 & Cat 10 (solid)	Disposal in secured landfill

Notes:

Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be as specified in Schedule-I.

Waste collection bags for waste types needing incineration shall not be made on chlorinated plastics.

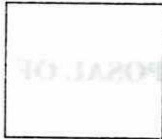
Categories 8 and 10 (liquid) do not require containers/ bags.

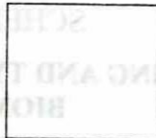
Category 3 # disinfected locally need not be put in containers/ bags.

SCHEDULE III (See Rule 6)

LABEL FOR BIOMEDICAL WASTE CONTAINERS/ BAGS

BIOHAZARD SYMBOL **CYTOTOXIC HAZARD SYBOL**





HANDLE WITH CARE

Note: Label shall be non-washable and prominently visible.

SCHEDULE IV (See Rule 6)

LABEL FOR TRANSPORT OF BIOMEDICAL WASTE CONTAINERS/ BAGS

Day ________ Month ________

Year ________

Waste Category No. ______ Date of Generation ________

Waste Class

Waste description

Sender's Name and Address	Receiver's Name and Address
Phone No. ________	Phone No. ________
Fax No. ________	Fax No. ________
E-mail ID: ________	E-mail ID: ________
Contact Person ________	Contact Person ________

In case of emergency please contact:

Name and Address:

Phone No.

Note: Label shall be non-washable and prominently visible.

SCHEDULE V (See Rule 5 and Schedule I)

STANDARDS FOR TREATMENT AND DISPOSAL OF BIOMEDICAL WASTES

Standards for Incinerators:

All incinerators shall meet the following operating and emission standards:

A. Category Standards

1. Combustion Efficiency (CE) shall be atleast 99.00%
2. The combustion efficiency is computed as follows:

$$CE = \frac{\%CO2}{\%CO2 + \%CO} \times 100$$

3. The temperature of the primary chamber shall be 800 ± 50°C.
4. The secondary chamber gas residence time shall be atleast 1 (one) second at 1050 ± 50C, with minimum 3% Oxygen in the stack gas.

Emission Standards

	Parameters	Concentration mg/Nm3 at (12% CO2 correction)
1.	Particulate matter	150
2.	Nitrogen Oxides	450
3.	HCI	50

4. Minimum stack height shall be 30 metres above ground
5. Volatile organic compounds in ash shall not be more than 0.01%

Suitably designed pollution control devices should be installed/ retrofitted with the incinerator to achieve the above emission limits, if necessary.

Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants.

Chlorinated plastics shall not be incinerated.

Toxic metals in incineration ash shall be limited within the regulatory quantities as defined under the Hazardous Waste (Management and Handling Rules) 1989.

Only low sulphur fuel like L.D.O/ L.S.H.S/ Diesel shall be used as fuel in the incinerator.

MINISTRY OF ENVIRONMENT AND FORESTS NOTIFICATION

New Delhi, the 6th March, 2000

S.O. 201 (E) – In exercise of the powers conferred by Section 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules further to amend the Biomedical Waste (Management and Handling) Rules, 1996, namely:

1. (1) The rules may be called the Biomedical Waste (Management and Handling) (Amendment) Rules, 2000.

   (2) They shall come into force on the date of their publication in the Official Gazette.

2. In the Biomedical Waste (Management and Handling) Rules, 1996, for Schedule VI, the following Schedule VI shall be substituted, namely:

SCHEDULE VI (See Rule 6)

SCHEDULE FOR WASTE TREATMENT FACILITIES like Incinerator/ Autoclave/ Microwave System

A.	Hospitals and Nursing Homes in towns with population of 30 lakhs and above	30th June 2000 or earlier
B.	Hospitals and Nursing Homes in tows with population of below 30 lakhs	
	a) with 500 beds and above	by 30th June 2000 or earlier
	b) with 200 beds and above but less than 500 beds	by 31st December 2000 or earlier
	c) with 50 beds and above but less than 200 beds	by 31st December 2001 or earlier
	d) with less than 50 beds	by 31st December 2002 or earlier
C.	All other institutions generating biomedical waste not included in A and B above	by 31st December 2002 or earlier

Review Questions:

1. Explain the guidelines for handling and disposing biomedical waste.
2. Describe the categories of biomedical waste and colour coding and type of container.
3. What are the hazards and risk due to exposure of infected or hazardous waste?
4. Explain the mode of infection.
5. Explain the method of disposal of biomedical waste.
6. Explain the salient points of biomedical waste management handling rules.
7. Write notes on: (a) Standards for Waste Autoclaving; (b) Deep Burial.

*   *   *

UNIT – 5
HUMAN WASTE DISPOSAL

EXCRETA DISPOSAL

Human excreta is a source of infection. It is an important cause of environmental pollution. Every society has a responsibility for its safe removal and disposal so that it does not constitute a threat to public health. The ***health hazards*** of improper excreta disposal are:

- Soil Pollution
- Water Pollution
- Contamination of foods, and
- Propagation of flies

The resulting diseases are typhoid and paratyphoid fever, dysenteries, diarrhoeas, cholera, hookworm disease, ascariasis, viral hepatitis and similar other intestinal infections and parasitic infestations. These diseases are not only a burden on the community in terms of sickness, mortality and a low expectation of life, but a basic deterrent to social and economic progress. Proper disposal of human excreta, therefore, is a fundamental environmental health service without which there cannot be any improvement in the state of community health.

Extent of the Problem in India

In many areas of the world, including India, excreta disposal is a problem of great importance. Nearly 74 per cent of India's population live in rural areas and the majority of them "go to the fields" for defecation and thereby pollute the environment with human excrement. The situation is in no way better in urban areas. The Health Survey and Planning Committee (1962) reported that not more than 15 per cent of the urban population in India had the amenity of a sewerage system.

Statistics indicate that the intestinal group of diseases claim about 5 million lives every year while another 50 million people suffer from these infections:

i) Surveys carried out in the Assam, Bihar, Madhya Pradesh, Manipur, Orissa, Rajasthan and West Bengal show that the enteric group of

levers is very common in rural areas – the annual incidence varying from 102 to 2.119 per 1,00,000 of population.

ii) Hookworm disease is also known to be highly prevalent; about 45 million people are estimated to be infected with hookworms.

iii) The solution the problem is only through hygienic disposal of human excreta which is the corner-stone of all public health services.

Carrying Disease by Excreta

Let us consider how the faucal-borne diseases are transmitted to a new host. The human excreta of a sick person or a carrier of disease is the main focus of infection. It contains the disease agent which is transmitted to a new host through various channels: water, fingers, flies, soil and food. These events are shown in Fig. 5.1.

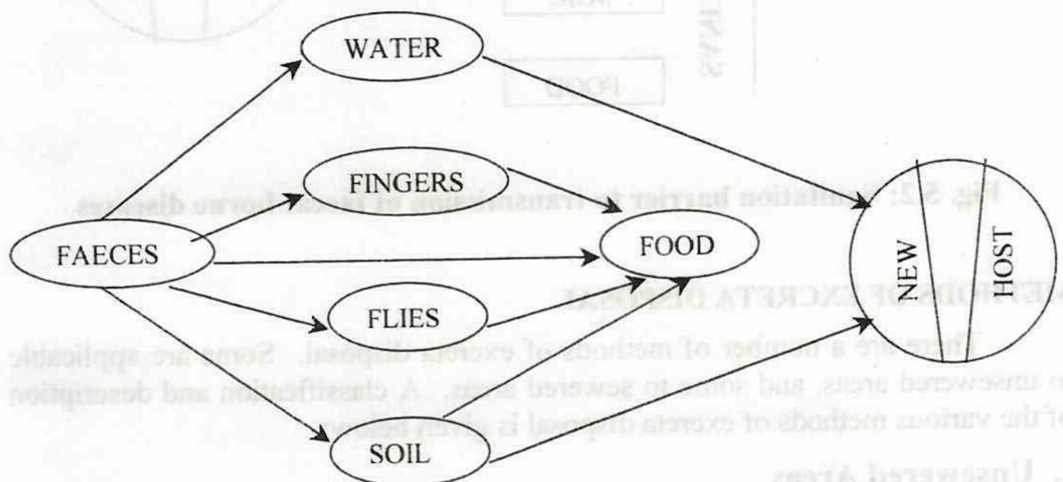


Fig.5.1: Transmission of faecal-borne diseases

Sanction Barrier

Community medicine aims at breaking the disease cycle at vulnerable points. The disease cycle (Fig.5.1) may be broken at various levels: segregation of faces, protection of water supplies, protection of foods, personal hygiene and control of files. Of these, the most effective step would be to segregate the faces

and arrange for its proper disposal so that the disease agent cannot reach the new host, directly or indirectly. Fig.5.2 shows the segregation of the excreta by improving a barrier called the "sanitation barrier". In simple terms, this barrier be provided by a 'sanitary latrine' and a disposal pit. The more elaborate schemes envisage installation of a sewerage system and sewage treatment plants.

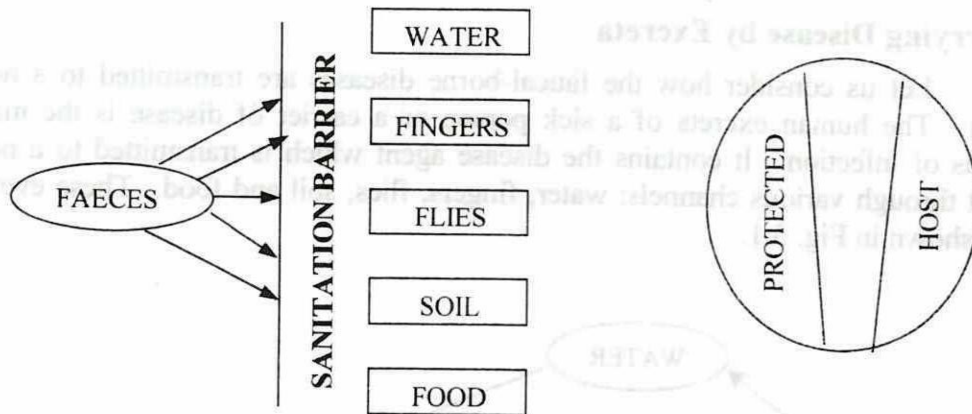


Fig. 5.2: Sanitation barrier to transmission of faecal-borne diseases

METHODS OF EXCRETA DISPOSAL

There are a number of methods of excreta disposal. Some are applicable to unsewered areas, and some to sewered areas. A classification and description of the various methods of excreta disposal is given below:

I. Unsewered Areas

1. Service Type (Conservancy System)

Nightsoil is collected from pail or bucket type of latrines by human agency, and later disposed of by burying or composting.

2. Non-service Type (Sanitary Latrines)

a) Borne hole latrine
b) Dug well or pit latrine
c) Water-seal type of latrines

- P.R.A.I. type
- R.C.A. type
- Sulabth Shauchalaya

d) Septic tank

e) Aqua privy

3. Latrines Suitable for Camps and Temporary Use

a) Shallow trench latrine

b) Deep trench latrine

c) Pit latrine

d) Bore hole latrine

II. Sewered Areas

1. Water-Carriage System and Sewage Treatment

a) Primary Treatment
- Screening
- Removal of grit
- Plain Sedimentation

b) Secondary Treatment
- Trickling filters
- Activated sludge process

c) Other Methods
- Sea Outfall
- River Outfall
- Sewage Farming
- Oxidation Ponds

I. Excreta Disposal in Unsewered Areas

1. Service Type (Conservancy System)

The collection and removal of nightsoil from bucket or pail latrines by human agency is called the service type or conservancy system, and the latrines are called service latrines. The nightsoil is transported in "nightsoil carts" to the place of final disposal, where it is disposed of by (i) composting or (ii) burial in a shallow trenches. Service latrines are a source of filth and insanitation. They

have all the drawbacks and faults which tend to perpetuate the disease cycle of faecal-borne diseases in the community (Fig.5.1). The night soil is exposed to files; there is always the possibility of water and soil pollution. The buckets and pans are subject to corrosion and require frequent replacement. The emptying operation of the buckets is not always satisfactory. It is also difficult to recruit adequate staff needed for the collection of nightsoil. If the sweepers go on strike, the entire machinery collapses with dire consequences to public health. Further, the employment of human labour for the collection of nightsoil is not consistent with human dignity and is no longer pardonable. The Environmental Hygiene Committee therefore, recommended that in unanswered areas the services latrines should be replaced by sanitary latrines which require no service, and in which excreta sanitary latrines which require no service, and in which excreta can be disposed of at the site of the latrine in a hygienic manner.

2. Non-Service Type of Latrines (Sanitary Latrines)

A sanitary latrine is one which fulfils the following criteria:

- Excreta should not contaminate the ground or surface water.
- Excreta should not pollute the soil.
- Excreta should not be accessible to files, rodents, animals (pigs, dogs, cattle etc) and other vehicles of transmission.
- Excreta should not create a nuisance due to odour or unsightly appearance.

A brief description of some of the well-known types of sanitary latrines is given below:

Bore Hole Latrine

The bore hole latrine is the forerunner of the non-service type of latrines in this country. It was first introduced by the Rockefeller foundation during 1930's in campaigns of hookworm control. The latrine consists of a circular hole 30 to 40cm (12-16 in.) in diameter, dug vertically into the ground to a depth of 4 to 8m (13-26 ft.), most commonly 6m (20ft.). A special equipment known as auger is required to dig a bore hole. In loose and sandy soils, the hole is lined with bamboo matting or earthen-ware rings to prevent caving in of the soil. A concrete squatting plate with a central opening and foot rests is placed over the hole. A suitable enclosure is put up to provide privacy. The nightsoil undergoes

purification by anaerobic digestion and is eventually converted into a harmless mass.

The merits of bore hole latrine are: (i) there is no need for the services of a sweeper for daily removal of nightsoil, (ii) the pit is dark and unsuitable for fly breeding, (iii) if located 15m (50ft.) away from a source of water supply, there should be no danger of water pollution.

Dug Well Latrine

Dug well latrine or pit latrine was first introduced in Singur, West Bengal in 1949-50. It is an improvement over the bore hole latrine. A circular pit about 75cm (30 in.) in diameter and 3 to 3.5m (10-12ft.) deep is dug into the ground for the reception of the nightsoil. In sandy soil, the depth of the pit may be reduced to 1.5 to 2m (6-7 ft.). The pit may be lined with pottery rings, and as necessary to prevent caving in of the soil may be used. A concrete squatting plate is placed on the pit, and the latrine is enclosed with a superstructure. The advantages of this type of latrine are: (i) it is easy to construct and no special equipment such as an auger is needed to dig the pit, (ii) the pit has a longer life than the bore hole because of greater cubic capacity.

Water Seal Latrine

A further improvement in the designing of sanitary latrines or rural families is the hand-flushed "water seal" type of latrine. Here, the squatting plate is fitted with a water seal. The water seal performs two important functions: (i) it prevents success by files. That is, the nightsoil is sealed of from flies, by a small depth of water contained in a bent pipe called the trap. (ii) It prevents escape of odours and foul gases and thereby eliminates the nuisance from smell. Once the latrine is flushed, nightsoil is no longer visible. These merits have rendered the water seal type of latrine more acceptable to rural people than the bore hole or pit privy without water seal.

1. Location

The safe distance between the latrine and a source of water supply will depend upon the porosity of the soil, level of ground water, its slope and direction of flow. In general, that latrines of any kind should not be located within 15m (50 ft.) from a source of water supply, and should be at a lower elevation to prevent the possibility of bacterial contamination of the water

supply. Where possible, latrines should not be located in areas usually subject to flooding.

2. Squating Plate

The squatting plate or slab is an important part of a latrine. It should be made of an impervious material so that it can be washed and kept clean and dry. It is made of cement concrete with minimum dimensions of 90cm square and 5cm thickness at the outer edge. There is a slope ½ inch towards the pan. This allows drainage into the latrine of water used for cleaning purposes.

3. Pan

The pan receives the nightsoil, urine and wash water. The length of the pan is 42.5cm and the width is 12.5cm. There is a uniform slope from front to back of the pan. The pan is given a smooth finish.

4. Trap

The trap is a bent pipe, about 7.5cm in diameter and is connected with the pan. It holds water and provides necessary 'water seal'. The water seal is the distance between the level of water in the trap and the lowest point in the concave upper surface of the trap. The water seal prevents the access by flies and suppresses the nuisance from smell.

5. Connecting Pipe

Then the pit is dug, away from the squat plate, the trap is connected to the pit by a short length of connecting pipe. A latrine of this type is called the indirect type because the pit is sited away form the squatting plate. In the direct type there is no need for a connecting pipe. The direct type is best suited for areas where the ground is hard and does not easily cave in. The direct type is cheaper and easier to construct and occupies less space. An advantage with the indirect type is that when the pit fills up, a second pit can be put into operation by merely changing the direction of the connecting pipe. Therefore, the indirect type is usually preferred.

6. Superstructure

The desired type of superstructure may be provided for privacy and shelter. An attractive superstructure with a neat finish is desirable as this will be generally well maintained.

7. Maintenance

The life of a latrine will depend upon several factors such as care in usage and maintenance. The latrine should be used only for the purpose intended and not for disposal of refuse or other debris. The squatting plate should be washed frequently and kept clean and dry. People should learn to flush the pan after use with adequate quantity of water. One of two litres of water are sufficient to flush the RCA latrine. Thus, proper maintenance involves health education of the people which is very necessary for the success of any latrine programme.

Septic Tank

The septic tank is water-tight masonry tank into which household sewage is admitted for treatment. It is a satisfactory means of disposing excreta and liquid wastes from individual dwellings, small groups of houses and institutions which have adequate water supplies but do not have access to a public sewerage system.

There are two stages in the purification of sewage. The first stage, anaerobic digestion takes place in the septic tank proper, and the second stage, aerobic oxidation takes place outside the septic tank, in the sub-soil. Together, these two stages complete the purification of sewage.

Operation and Maintenance

- The use of soap water and disinfectants such as phenol should be avoided as they are injurious to the bacterial flora in the septic tank.
- Undue accumulation of sludge reduces the capacity of the septic tank and interferes with proper working. Therefore, the contents of the septic tank should be bailed out at least once a year. This operation is called *desludging*. The bailed out sludge is disposed by trenching.
- Newly built septic tanks are first filled with water up to the outer level and then seeded with sludge drawn from another septic tank, to provide the right type of bacteria to carry out the decomposition process.

Aqua Privy

The aqua privy functions like a septic tank and has been used in different regions in the country. The privy consists of a water-tight chamber filled with

water. A short term of a drop pipe from the latrine floor dips into the water. The shape of the tank may be circular or rectangular. The size of the tank depends upon the number of users. A capacity of one cubic metre is recommended for a small family, allowing 6 years or more for leasing purposes. Aqua privies are designed for public use also.

Night soil undergoes purification by anaerobic digestion. Since there is evolution of gases, a vent should be provided for the escape of gases into the atmosphere, the vent should be open above the roof of dwellings. The digested sludge which accumulates in the tank should be removed at intervals.

Shallow Trench Latrine

This is simply a trench with ordinary tools. The trench is 30cm wide and 90-150cm deep. Its length depends on the number of users; 3-3.5m are necessary for 100 people. Separate trenches should be provided for men and women. The earth from the trench should be piled up at the slide. People should be instructed to cover faeces with earth each time they use the latrine. However, these instructions may not be carried out, and it will be necessary to post sweepers in attendance to do this work. Ablution water should be provided. The shallow trench is a rudimentary arrangement for a short period. When the trench is filled to 30cm below ground level, it must be covered with earth, heaped above ground level and compacted, if necessary, a new trench must be dug.

Deep Trench Latrine

This type of latrine is intended for camps of longer duration, from a few weeks to a few months. The trench is 1.8 to 2.m deep and 75-90cm wide. Depending upon the local customs, a seat or a squatting plate is provided. A superstructure is built for privacy and protection. Other requirements are the same as for shallow trench latrine.

Water Carriage System

The water carriage system or sewerage system implies collecting and transporting of human excreta and waste water from residential, commercial and industrial areas, by a network of underground pipe, called *sewers* to the place of ultimate disposal. It is the method of choice for collecting and transporting sewage from cities and towns where population density is high.

A water carriage system consists of the following elements:

1) Household sanitary fitting (plumbing system of buildings)
2) House sewers
3) Street sewers or Trunk sewers
4) Sewer appurtenances: manholes, traps etc.

Sewage Wastes

Sewage is waste water from a community, containing so and liquid excreta, derived from houses, street washings, factories and industries. It resembles dirty water with an unpleasant smell. The term *sullage* is applied to waste water which does not contain human excreta, e.g. waste water from kitchens and bathrooms. The amount of sewage that flow in the sewers depends upon habits of the people. If people use more water, there will be more sewage.

Health Aspects

Unless prompt measures are taken to provide proper mean of sewage disposal, the following environmental problems may be created:

- Creation of nuisance, unsightliness and unpleasant odours
- Breeding of files and mosquitoes
- Pollution of soil and water supplies
- Contamination of food
- Increase in the incidence of disease, especially helminthic diseases

Composition of Sewage

Sewage contains 99.9 per cent of water. The solids which comprise barely 0.1 per cent are partly organic and partly inorganic, they are partly in suspension and partly in solution. The offensive nature of the sewage is mainly due to the organic matter which it contains. The organic matter decomposes according to the laws of nature during which process it gives offensive odours.

Sewage Purification

Raw sewage or inadequately treated sewage should not be charged into rivers, sea or other sources of water supply. This because, the oxygen in the water supply is used up by the numerous aerobic bacteria found in the sewage. Depletion of oxygen may lead to the death of the plant and animal life. Further, the water may yield an offensive smell because of the release of hydrogen sulphide.

The aim of sewage treatment is to "stabilize" the organic matter so that it can be disposed off safely; and, to convert the sewage water into an effluent of an acceptable standard of purity which can be disposed of into land, rivers or sea.

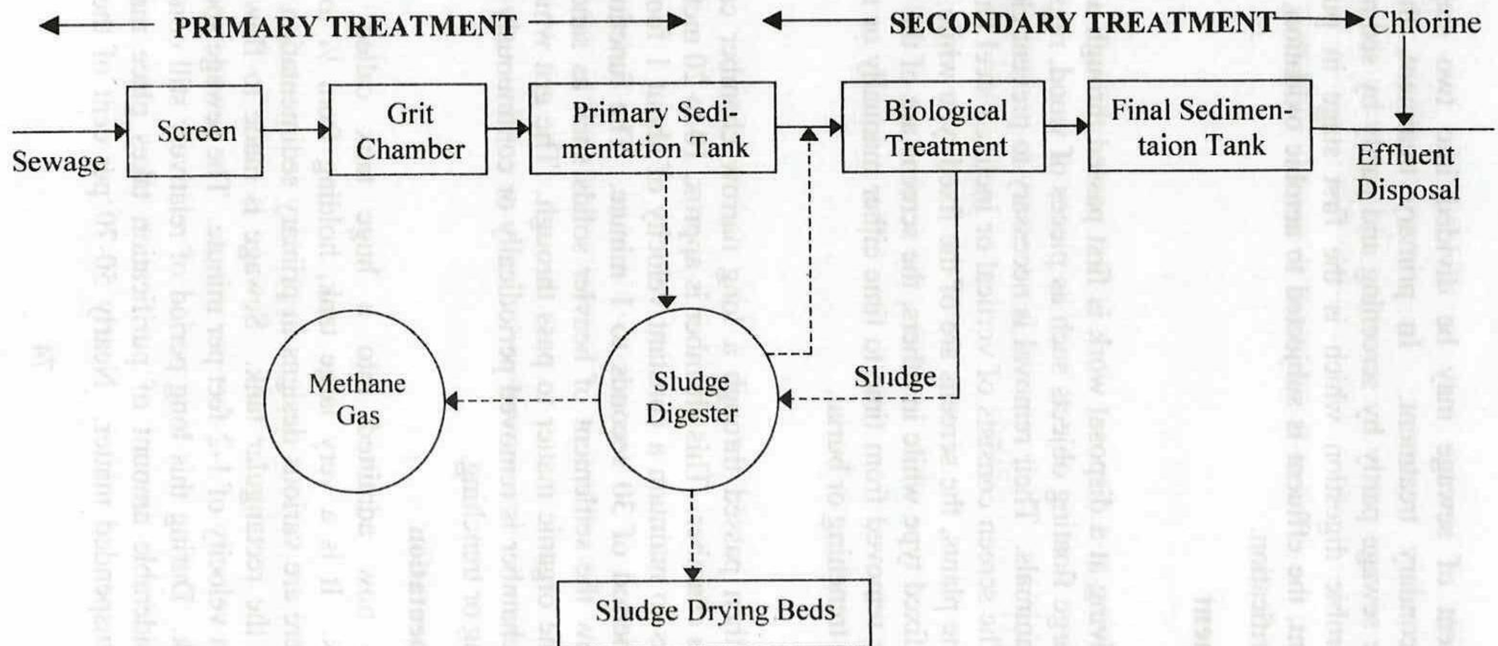
Decomposition of Organic Matter

The decomposition of organic matter in sewage takes place by two processes: aerobic and anaerobic processes.

1) ***Aerobic Process:*** It is the most efficient method of reducing the organic matter in sewage. The process requires a continuous supply of free dissolved oxygen. The organic matter is broken down into simpler compounds namely CO_2, water, ammonia, nitrites, nitrates and sulphates by the action of bacterial organisms including fungi and protozoa.
2) ***Anaerobic Process:*** Where the sewage is highly concentrated and contains plenty of solids, the anaerobic process is highly effective. The end-products of decomposition are methane, ammonia, CO_2 and H_2. In anaerobic decomposition, the reactions are slower and the mechanism of decomposition extremely complex.

MODERN SEWAGE TREATMENT

Modern sewage treatment plants are based on biological principles of sewage purification, where the purification is brought about by the action of anaerobic and aerobic bacteria. The following figure shows the flow diagram of a modern sewage treatment plant.


MODERN SEWAGE TREATMENT PLANT
PRIMARY TREATMENT
SECONDARY TREATMENT
Chlorine
Sewage
Screen
Grit Chamber
Primary Sedi-mentation Tank
Biological Treatment
Final Sedimen-taion Tank
Effluent Disposal
Methane Gas
Sludge Digester
Sludge
Sludge Drying Beds

The treatment of sewage may be divided into two stages, primary treatment and secondary treatment. In primary treatment, the solids are separated from the sewage partly by screening and partly by sedimentation and subjected to anaerobic digestion which is the first stage in purification; in secondary treatment, the effluent is subjected to aerobic oxidation, which is the second stage in purification.

Primary Treatment

1. Screening

Sewage arriving at a disposal work is first passed through a metal screen which intercepts large floating objects such as pieces of wood, rags, masses and garbage and dead animals. Their removal is necessary to prevent clogging of the treatment plant. The screen consists of vertical or inclined steel bars usually set 5cm apart. In some plants, the screens are of the fixed type while in others, the screens are of the fixed type while in others, the screens are of the moving type. The screenings are removed from time to time either manually or mechanically, and disposed of by trenching or burial.

2. Grit Chamber

Sewage is then passed through a long narrow chamber called the grit chamber or detritus chamber. This chamber is approx. 10 to 20 metres in length; it is so designed as to maintain a constant velocity of about 1 foot per second, with a detention period of 30 seconds to 1 minute. The function of the grit chamber is to allow the settlement of heavier solids such as sand and gravel, while permitting the organic matter to pass through. The grit which collects at the bottom of the chamber is removed periodically or continuously and disposed of by plain dumping or trenching.

3. Primary Sedimentation

Sewage is now admitted into a huge tank called the primary sedimentation tank. It is a very large tank, holding from ¼ to 1/3 the dry weather flow. There are various designs in primary sedimentation tank. By far the commonest is the rectangular tank. Sewage is made to flow very slowly across the tank at a velocity of 1-2 feet per minute. The sewage spends about 6-8 hours in the tank. During this long period of relatively still conditions in the tank, a very considerable amount of purification takes place mainly through sedimentation of suspended matter. Nearly 50-70 per cent of the solids settle

down under the influence of gravity. A reduction of between 30 to 40 per cent in the number of coliform organizations is obtained. The organic matter which settles down is called sludge and is removed by mechanically operated devices, without disturbing the operation in the tank. While this is going on, a small amount of biological action also takes place in which the micro-organisms present in the sewage attack complex organic solids and break them down into simpler soluble substances and ammonia. A certain amount of fat and grease rise to the surface to form scum which is removed from time to time and disposed of. When the sewage contains organic trade wastes, it is treated with chemicals such as lime, aluminium sulphate and ferrous sulphate. Addition of one of these chemicals precipitates the animal material quickly.

Secondary Treatment

The effluent from the primary sedimentation tank still contains a proportion of organic matter in solution or colloidal state, and numerous living organisms. It has a high demand for oxygen and can cause pollution of soil or water. It is subjected to further treatment, aerobic oxidation, by one of the following methods:

(a) Trickling Filter Method

(b) Activated Sludge Process

Trickling Filter

The trickling filter or percolating filter is a bed of crushed stones or cinker, 1 to 2m deep and 2 to 30m in diameter, depending upon the size of the population. The effluent from the primary sedimentation tank is sprinkled uniformly on the surface of the bed by a revolving device. The device consists of hollow pipes each of which have a row of holes. The pipes keep rotating, sprinkling the effluent in a third film on the surface of the filter. Over the surface and down through the filter, a very complex biological growth consisting of algae, fungi, protozoa and bacteria of many kinds occurs. This is known as the "zoogleal layer". As the effluent percolate through the filter bed, it gets oxidized by the bacterial flora in the zoogleal layer. The action of the filter is thus purely a biological one, and not one of filtration as the name suggests. The term "filter" is a misnomer. The trickling filters are very efficient in purifying sewage. They do not need rest pauses because wind blows freely through the beds supplying the oxygen needed by the zoogleal flora. The biological growth

of zoogleal layer lives, grows and dies. The dead matter slough off, breaks away and is washed down the filer. It is a light green, flocculent material and is called "humus". The oxidizer sewage is now led into the secondary sedimentation tanks of humus tanks.

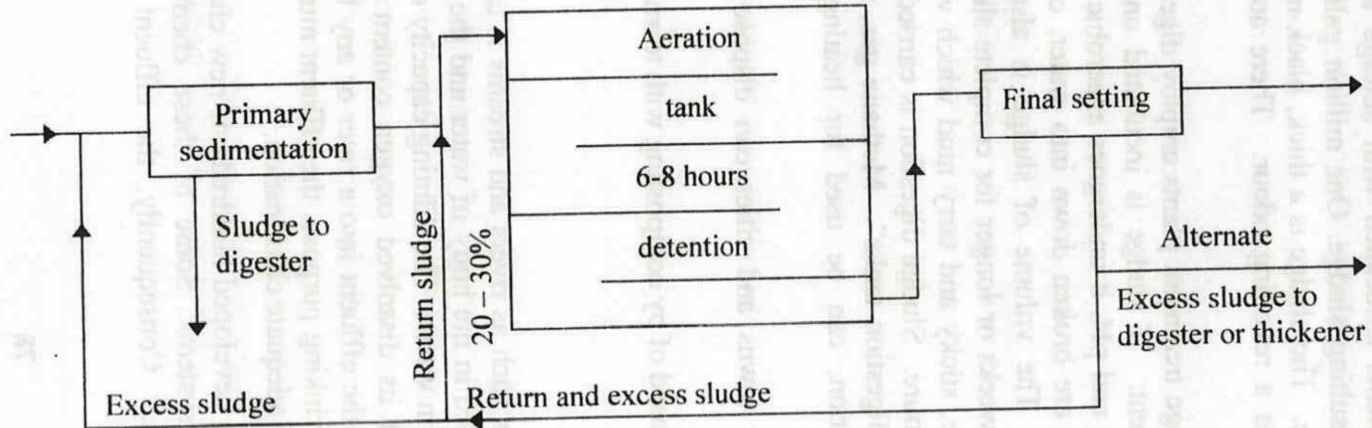
Activated Sludge Process

Activated sludge process as shown in the following figure, is the modern method of purifying sewage, in place of the trickling filter. The "heart" of the activated sludge process is the aeration tank. The effluent from the final settling tank (also known as activated sludge or return sludge, this sludge is a rich culture of aerobic bacteria). The proportion of activated sludge to the incoming effluent is of the order of 20 to 30 per cent. The mixture is subjected to aeration in the aeration chamber for about 6 to 8 hours. The aeration is accomplished either by mechanical agitation or by forcing compressed air continuously from the bottom of the aeration tank. This latter method, also known as 'diffuse aeration' is considered a better method of aeration. During the process of aeration the organic matter of the sewage gets oxidized into carbon dioxide, nitrate and water with the help of the aerobic bacteria in the activated sludge. The typhoid and cholera organisms are definitely destroyed and the coliforms greatly reduced. Activated sludge plants occupy less space, require skilled operations. One acre of activated sludge plant does the work of 10 acres of percolatin filter. Activated sludge process is therefore, best suited for large cities and the percolating filter for smaller towns because they are cheaper to install and easier to operate.

Secondary Sedimentation

The oxidized sewage from the trickling filter or aeration chamber is led into the secondary sedimentation tank where it is detained for 2 to 3 hours. The sludge that collects in the secondary sedimentation tank is called 'aerated sludge' or activated sludge, because it is fully aerated. It differs from the sludge in the primary sedimentation tank in that it is practically inoffensive and is rich in bacteria, nitrogen and phosphates. It is a valuable manure, dehydrated. Part of the activated sludge is pumped back into the "aeration tanks" in the activated sludge process and the repumped into the sludge digestion tanks for treatment and disposal.

ACTIVATED SLUDGE PROCESS



Sludge Digestion

One of the greatest problems associated with sewage treatment – the treatment and disposal of the resulting sludge. One million gallons of sewage produces 15 to 20 tons of sludge. The sludge is a thick, black mass containing 95 per cent of water, and it has a revolting odour. There are a number of methods of sludge disposal:

(a) ***Digestion:*** Modern sewage treatment plants employ digestion of sludge as the method of treatment. If sludge is incubated under favourable conditions of temperature and pH, it undergoes anaerobic auto-digestion in which complex solids are broken down into water, carbon dioxide, methane and ammonia. The volume of sludge is also considerably reduced. It takes 3 to 4 weeks or longer for complete sludge digestion. The residue is inoffensive, sticky and tarry mud which will dry readily and form an excellent manure. Sludge digestion is carried out in special tanks known as "sludge digestion tanks". Methane gas, which is a by-product of sludge digestion, can be used for heating and lighting purposes.

(b) ***Sea Disposal:*** Sea cost towns and cities can dispose of sludge by pumping it into the sea.

(c) ***Land:*** Sludge can be disposed of by composting with town refuse.

Disposal of Effluent

Disposal into water courses such as rivers and streams is called 'disposal by dilution'. The effluent is diluted in the body of water and the impurities are oxidized by the dissolved oxygen in water. The diluting capacity of the river for the receiving body of water and its dissolved oxygen content are important considerations before discharging the effluent into a river or any body of water. Since people use river water for drinking purpose, the effluent must be rendered free from pathogenic organisms by adequate chlorination.

Recently, the industries has developed hundreds of new chemicals which are released into the sewerage systems. Some of these chemicals are not removed by biological treatment. Consequently, the effluent may contain

substances toxic to man, or substances that can kill fish, damage agriculture or interfere with the normal functioning of a stream.

Other Methods of Sewage Disposal

(a) Sea outfall

(b) River outfall

(c) Land treatment

(d) Oxidation ponds

(a) Sea Outfall

Sea coast towns and cities may dispose of their sewage by discharging it into the sea. Purification takes place by dilution in the large body of sea water, and the solids get slowly oxidized. The drawback of this method is that the offensive solid matter may be washed back to the shore and create public nuisance. In order to prevent this, the sewage outfall is designed to discharge the sewage into deep water at many points.

(b) River Outfall

Raw sewage should never be discharged into rivers. The present day practice it to purify the sewage before it is discharged into rivers. How far the sewage should be purified, depends upon the dilution, the river provides to carry on aeration and self-purification.

(c) Land Treatment *(Sewage Farming)*

If sufficient and suitable land (porous soil) is available, sewage may be applied to the land after grit removal, screening and a short period of settlement. This type of treatment is practised in some Indian towns and cities and is known as Sewage Farming or Broad irrigation.

(d) Oxidation Pond

A cheap method of sewage treatment is the oxidation pond which has been referred to by many different names – waste stabilization pond, redox pond, sewage lagoons etc. The term "waste, stabilization pond" is more appropriate. The term 'waste' includes both sewage and industrial wastes. Although an old method of purifying sewage, oxidation pond has attracted the attention of public health engineers only recently.

SOCIAL ASPECTS OF EXCRETA DISPOSAL IN INDIA

India is a land of villages and about 74 per cent of its population lives in villages. The problem of sanitation therefore is one of "Rural sanitation". Surveys have shown that 90 per cent of the population "go to the open fields" for defecation. This habit of indiscriminate fouling of the surroundings with human excrement is generations – old, and rooted firmly in the cultural behaviour of the Indian village people.

In urban areas, the latrine is considered a necessary part of a house. In rural areas, by and large, people have not accepted latrines with any enthusiasm, and even when installed only a few used them regularly. The problem in rural sanitation is how to overcome the resistance of the village people and induce them to use sanitary latrines. Research studies have indicated that there is only one way to solve the problem, i.e. through health education. Social scientists have listed the reasons why villagers do not accept latrines. Some of the reasons found in the surveys are:

- Latrines are associated with bad smell
- They are the breeding places of flies
- They are something foul and dirty so that one should not have them close to houses
- Latrines are costly and beyond their means to install
- They do not know how faecal-borne diseases are spread.

In short, people have a bad *image* of latrines in their minds. Secondly, using a latrine goes against a *daily* habit pattern of going to the fields. The use of latrines involves a drastic change in the day to day behaviour of a large number of people.

The solution to the problem lies in teaching the people first the reasons why latrines are important. The teaching should be undertaken by all known methods of health education – direct discussion, group discussion, latrine demonstration and use of visual aids and above all service facilities. The ultimate goal of health education will be to motivate the rural people towards acceptance and use of sanitary latrines.

Surface Water Drainage in Urban Areas

Many low income communities in developing countries consider storm water drainage to be their most urgent need as far as urban infrastructure is concerned. It is the coastal region of the world that have the highest average rainfall, but the flaw estuarine terrain and often impermeable alluvial soil make drainage difficult. Even in the arid areas, where average rainfall is low, tropical rainfall – when it comes – is more intense than its temperature climates, and the lack of vegetation and of adequate drainage means that torrents of water can form in minute causing damage to homes and property which will take years to repair. The lack of drainage is especially serious where the ground is either steeply sloping as in Hongkong or very flat as in Kolkata, Bangkok and Manila.

Deaths due to drowning in floods or burial beneath landsides or collapsing homes are perhaps the most dramatic signs of the suffering that drainage can help to alleviate. Less noticeable to an outsider, but of greater impact on the residents living in a poor community, is the steady toll of disease disability and death by standing water.

First in public health importance are the many "faecal-oral" infections acquired by consumption of contaminated food and drink. Children are particularly exposed to infection when play in or bathing in surface water. Surface water becomes contaminated with pathogens from blocked sewers and overflowing septic tank. This contaminated surface water can infect people in many way.

Another important group of diseases related to poor drainage is transmitted by mosquitoes and malaria is the best example. Transmission can be particularly intense in urban species of mosquito from human blood meals. Drainage construction is an effective mosquito control measure. It is cheaper than application of insecticides and does not have to be repeated regularly. Unlike insecticides, it can have a detrimental effect on the environment on the contrary, constitutes an environmental improvement.

Urban poor may often build on land with drainage problems, but good urban planning can help to avoid making those problems worse. One of the simplest planning measure is to set out regular plots before house building starts in an area, leaving space for well-aligned roads. Adequate road width and alignment will make it much easier to build drains when they are needed later.

Review questions:

1. Explain the methods of excreta disposal.
2. Explain the methods of disposal of sewage waste.
3. What are all the social aspects of excreta disposal in India?
4. Explain diseases carried from excreta/ sanitation barriers.

*   *   *

UNIT – 6

MEDICAL INSURANCE

The hospital employees, patients and society faces health hazard in the form of spread of infections and disease due to improper disposal of waste. Hospital employees come in close contact with infected tissues, biological fluids, and infected materials of patients. Similarly, the doctors, nurses, technical and other staff working in hospitals face the risk of accidental infection. Again the patients also have the possibility of getting cross infection and hospital related infection. Even, the visitors who make the courtesy call on the inpatients, sometimes are exposed to the risk of getting infected. These category of people requires some sort of protection, other than the precautions taken by the hospitals and one such protection is giving them insurance cover. The medical insurance, one of the types of insurance provides such protection.

The medical insurance is provided both by government and private insurance companies. A brief explanation about these agencies are discussed in this unit.

LIFE INSURANCE FOR PEOPLE WITH MEDICAL PROBLEMS

If an insurance agency has an in-house specialist who deals with impaired risks, he could deal with medical insurance effectively.

The former managers who worked at insurance companies can also make good impaired-risk specialists. They are especially valuable, since they have supervised the processing of hundreds of impaired-risk applications and are familiar with the risks involved in insuring people with medical conditions.

If the company does not have a full-time specialist or a consultant, look for an agent who has experience in finding life insurance for people with medical conditions. Agents who have more than 10 years of experience, or who write 15 to 20 percent of their policies for people with health problems, can be just as knowledgeable. These agents as intermediaries will contact a number of insurers and solicit quotes for life insurance policies.

How Special-risk Agents Help ?

When an application for insurance is received by the insurance company, the medical records of the applicant will be scrutinised. Basing on the result, the agency will decide whether to offer the policy, and fix the premium amount.

After consolidating the complete medical file and sending that information to the insurers special-risk agents work to find "standard" life insurance policies for their clients. Further, they will also try to secure the lowest possible rates, even if other insurance companies set higher premiums. Competition from specialist agents and insurers has pressured traditional insurance companies to make better offers to consumers with health problems.

Special-risk agents most commonly work with people who have been diagnosed with or have a history of the following:

- Alcohol or drug abuse
- Cancer
- Depression
- Diabetes
- Hazardous occupations or hobbies
- Heart disease
- Hepatitis C
- Hypertension
- Obesity
- Stroke
- Tobacco use

For more serious or less common conditions, a good special-risk agent can almost always find a life insurer who will issue a policy, which is normally high expensive.

The healthier you are, the less risk you represent. When you buy your life insurance policy, many companies can even give you specific requirements for a premium reduction.

Your improved health can't be a "flash in the pan"

To qualify for lower premiums due to health improvements, many insurance companies require you to show medical proof from your doctor that yo have maintained those improvements for a specific period of time. For example, if you had high blood pressure that later went down, an insurance company might look at all of your blood pressure readings for the past year to determine whether you warrant a premium reduction.

For more severe health problems, such as cancer and heart disease, the time period for showing improved health can be longer. Getting a premium reduction after suffering a serious condition such as cancer is possible, but a company may require that the cancer be in remission for a long time - such as 5 to 10 years - before reducing your insurance bill.

There are some ailments for which it is unlikely you will ever get a reduction. For example, heart-wall damage is a condition that will not improve, thus making it nearly impossible to get a reduction.

In some cases, the company will require you to undergo its own medical tests (collecting blood and urine samples, for example) to verify the information from your doctor. What happens if while checking for improvement for one medical condition, another serious problem is detected? Under most insurance policies, your rate would not increase. For example, if you lowered your cholesterol but the blood test showed you had developed diabetes, your premium would not increase.

MEDICARE

The Centers for Medicare & Medicaid Services (CMS) is the Federal agency that runs Medicare at U.S. Medicare is health insurance for people age 65 or older, under age 65 with certain disabilities, and any age with End-Stage Renal Disease (permanent kidney failure requiring dialysis or kidney transplant).

Medicare has

- Part A (Hospital)
- Part B (Medical)
- Part C (Medicare Advantage Plans)
- Part D (Medicare Prescription Drug Coverage)

Medicare Part A helps cover inpatient care in hospitals. This includes critical access hospitals and skilled nursing facilities. It also covers home health care. The premium paid by the individual also covers his/her spouse. The premium need not be paid separately as it is included in Medicare taxes, paid by the individuals.

Medicare Part B helps cover medical services like doctors' services, outpatient care, and other medical services that Part A does not cover. Part B is optional. It helps pay for covered medical services and items when they are medically necessary. It also covers some preventive services. These include a one- time "Welcome to Medicare" physical exam, bone mass measurements, flu and pneumococcal shots, cardiovascular screenings, cancer screenings, and diabetes screenings, and more.

Medicare Part .C, Advantage Plans are health plan options that are approved by Medicare but run by private companies. They are part of the Medicare Program, and sometimes called "Part C." They provide all Part A and Part B coverage and must cover medically-necessary services. They generally offer extra benefits, and many include Part D drug coverage.

Medicare Part D offers prescription drug coverage for everyone with Medicare. Part D is optional. This coverage may help lower prescription drug costs and help protect against higher costs in the future. It can give greater access to drugs that is used to prevent complications of diseases and stay well. These plans are run by insurance companies and other private companies approved by Medicare.

Medicare Advantage Plans

Medicare Advantage Plans offer you many different ways to get your Medicare Part A, Part B, and Part D coverage. To join a Medicare Advantage Plan, you must have both Medicare Part A and Part B and live in the plan's service area. With Medicare Advantage, the choices may include

- Medicare Preferred Provider Organization (PPOs) Plans,
- Medicare Health Maintenance Organization (HMOs) Plans,
- Medicare Private Fee-for-Service (PFFS) Plans,
- Medicare Special Needs Plans, and
- Medicare Medical Savings Account (MSA) Plans.

THIRD-PARTY INSURANCE

In many countries, bills relating to hospitalization are met by third-part payers – Government agencies, insurance firms, employers – and beyond payment of premiums, patients are not involved in settlement of the major portion of the hospital bill. It was therefore, customary for patients to demand the 'best' and hospitals and practitioners, to play safe and to increase their revenue, administered more diagnostic and treatment procedures than necessary, claiming the full charge from the same third-party payers. All these resulted in spiraling costs of medical care. With the introduction of diagnosis related (DRG) reimbursement, a way has been found of curtailing hospital costs while at the same time ensuring quality and increasing efficiency. The US Government Health Care Financing Administration now reimburses hospitals involved in Medicare and Medicaid predetermined amounts based on the diagnosis reported and not on the basis of the actual procedures carried out, length of hospitalization etc. This practice is spreading to other countries – Australia, United Kingdom, Germany, Nordic countries. Efficient hospitals can profit through this system by retaining the difference between he amount reimbursed for the particular disease treated and the actual costs of treatment, whereas inefficient hospitals must absorb the difference. In India, there is an increasing trend toward third-party payments. They, along with the Government can exert sufficient pressure to demand a better quality of service at a reasonable cost.

FAMILY HEALTH PLAN LIMITED

Family Health Plan Ltd (FHPL) is an IRDA approved, licensed agency operating since 1996, to implement Health Insurance or Social Welfare related scheme for the masses in India. FHPL has evolved as the first and one of the largest licensed Third Part Administrator (TPA) providing its services to over 3.9 million lives through its more than 2800 network of providers across the country. FHPL is the nominated TPA for servicing the policyholder of nationalised as well as private insurance companies. FHPL is the only TPA in the country to be certified as ISO 9001: 2000 by TUV standards for systems and processing.

As a TPA, FHPL acts as nodal agency between the insurance companies, insured member and the hospirals (provider of services) for rendering the right service, at right time, to the right person, at a right place.

FHPL has contributed at large in transforming the old health insurance mechanism into the newer user friendly, efficient and cost effective instrument. FHPL has gained in-depth domain expertise in analysing the group risk and requirements and thereby has assisted the insurance companies and large groups in designing suitable product of Health Insurance or Self Funded schemes.

FHPL is the first TPA to conceptualise, design and implement the Self Funded schemes for the first time in India. With nationwide presence through its 24 operational offices, FHPL envisages to build a future of health on a foundation of quality, integrity and high service standards.

FHPL is currently serving the insured members of:

- United India Insurance Co. Ltd.
- National Insurance Co. Ltd.
- New India Assurance Co. Ltd.
- Oriental Insurance Co. Ltd.
- ICICI Lombard General Insurance Co. Ltd.
- Reliance General Insurance Co. Ltd.
- Cholamandalam General Insurance Co. Ltd.
- HDFC Insurance Co. Ltd.
- IFFCO Tokio General Insurance Co.

Definitions

Insured: a member who has taken a Mediclaim policy to safeguard his/her own interests of health when needed.

Insurer: shall mean any one of the government of India Owned non-life insurance companies and any of the private insurance companies, who have been so licensed by IRDA.

Provider (NWH): is the Network Hospital (NWH) that has a contract with FHPL to serve the members of FHPL in providing cashless services as per the guidelines of FHPL.

Member(s): employee(s)/ individuals of the Member Organisation(s) and his/her dependant(s) who are eligible to the benefits of the Mediclaim policy formulated by Insurance and instead run Self Funded scheme for their members.

Dependant Member: shall mean the spouse, unmarried children and dependant parents for whom separate ID Cards have been issued or one family ID Card is issued with the photographs of all the members of the family.

Medical Benefits: means inpatient hospitalization relating to the ailments as specified by FHPL to the members.

Member Organisation(s): person(s)/ organisations/ insurance company's unrolled with FHPL for whom FHPL is providing assistance, advise and administrative services on various healthcare packages defined by FHPL for said persons/ organisations.

Pre-Authorisation: shall mean the prior written approval of FHPL for admitting the member(s) for extending credit treatment as per the stipulated norms by FHPL in the said pre-authorisation. Hospital shall obtain pre-authorisation from FHPL within 24 hours of hospitalization of a member patient for all emergency cases.

Pre-existing Ailment or Condition: of health be one where such disease has been in existence at prior to taking the Mediclaim Policy by the member/ being a member of the self-funded scheme. Pre-existing condition also means any sickness or its symptoms, which existed prior to taking the Mediclaim Policy by the members/ being a member of the self-funded scheme, whether or not the member had knowledge about the symptoms relating to the sickness. Complications arising from pre-existing ailment of related conditions will be considered part of that pre-existing condition.

Broadly the following documents will form the claim document:

- Photocopy of Member ID Card
- Photocopy of the policy papers (if any)
- Photocopy of pre-authorisation letter
- Original detailed discharge summary
- Original investigation reports
- Original hospital bill
- In case of surgical packages, detail breakup of the package
- Pharmacy bills and breakup

Steps in Extending Cashless Treatment to FHPL Member:

Step-1	For availing cashless treatment at NWH the member/ dependant approaches network hospital with FHPL ID card or printout of E-card
Step-2	For planned admission, forward the Admission Request Note (ARN) to FHPL atleast 24 hours prior to the hospitalization
Step-3	For emergency admission forward the ARN within 24 hours of hospitalization to FHPL
Step-4	FHPL will issue an authorization letter/ rejection note/ additional information request within one hour
Step-5	NWH extends credit treatment to the member/ dependants for the authorized services
Step-6	At the time of discharge, member/ dependant leaves back all the original documents with the NWH after signing on all the claim documents
Step-7	If any unauthorised treatment for the ailment/ disease that is not covered under the terms and conditions of the policy is taken by the member/ dependant she/he will have to make the payment to the NWH directly at the time of discharge from the hospital.
Step-8	Submit all the original claim documents (as mentioned above) to FHPL office within 7 working days after the member's discharge form the hospital, for early reimbursement.

Claims Management

At times there are discrepancy or deficiency in documents submitted along with the claims in such cases FHPL follows up with the hospital on the recovery of the documents and also educates the hospital on submission of

complete documents in future for an early settlement. For all essential documents the intimation is sent out within 24 hours of the identification of the deficiency.

List of Non-medical Items not covered under the Insurance

i) Registration/ Admission charges

ii) Ambulance charges

iii) Attendant pass

iv) Extra bed for attendant

v) Bed retaining charges

vi) Expenses on luxury items like Radio/ TV/ AC/ Telephone

vii) Expenses on vitamins, tonics, if not related to treatment

viii) Sanitary items

ix) Special duty nursing fee

x) Food and beverages for attendant

xi) Xerox/ Certifying charges/ Medical record charges

xii) Vaccination/ Nutrition and Dietetics

xiii) Expenses on spectacles/ hearing aids

xiv) Expenses on items stockings, cervical collar, L.S. belt, crutches, BP machines, thermometer, nebulae etc.

DO'S AND DON'TS FOR THE PERSONNEL MANAGING INSURANCE CELL AT THE NETWORK HOSPITALS

DO's

- Check the member's identification – FHPL ID card/ Pre-authorization letter – before extending cashless treatment by the hospital.
- Intimate FHPL atleast 3 to 4 days prior to admission for all pre-elective cases.

- ❖ Intimate FHPL office within 24 hours of admission for all emergency cases.
- ❖ Fill the ARN completely and duly signed by the treating doctor before sending to FHPL office.
- ❖ Mention the plan of treatment, probable duration of stay and estimated amount for the treatment on the ARN.
- ❖ Intimate FHPL office regarding enhancement of the authorised amount atleast 24 hours prior to discharge.
- ❖ In case timely pre-authorisation is not received from FHPL, kindly get in touch with the nearest FHPL local office to obtain the authorization letter.
- ❖ Extend the cashless treatment as per the guidelines mentioned in the FHPL authorization letter.
- ❖ Collect the amount billed for non-medical items, which are not payable under the insurance scheme.
- ❖ Duly signed claim form by the member has to be submitted along with the claim documents.

DO NOTs

- Do not hide relevant and factual information regarding the past and present history of the member.
- Do not extend credit treatment to unauthorised ailments/ procedures.
- Do not handover the original documents like discharge summary, reports, bills etc. to the member at the time of discharge.
- Do not extend cashless treatment to all outpatient services unless authorised by FHPL.
- Do not insist FHPL to authorise cashless admission for only diagnostic services, health checkups and investigation and evaluations.
- Do not extend credit to over and above the authorised limits and services.

rARAMOUNT HEALTH SERVICES PVT. LTD

Paramount Health Services Pvt. Ltd. is registered as Third Party Administrator and has obtained a license from the Insurance Regulatory and Development Authority to act as Third Party Administrator. It renders health care services to various individuals, who have obtained Mediclaim or Health Insurance policies from the following Insurance Companies with whom the Paramount Health Services Pvt. Ltd. has entered into the Agreements under the said Regulations:

- IFFCO Tokio General Insurance Co.
- ICICI Lombard General Insurance Co. Ltd.
- Reliance General Insurance Co. Ltd.
- New India Assurance Co. Ltd.
- United India Insurance Co. Ltd.
- National Insurance Co. Ltd.
- Bajaj Allianz General Co. Ltd.
- Cholamandalam General Insurance Co. Ltd.
- Oriental Insurance Co. Ltd.
- TATA-AIG General Insurance Co.
- Royal Sunderam General Insurance Co.

Paramount Health Services Pvt. Ltd. has approached the Provider to provide health care to the Patients, who require medical treatment under the Health Insurance policies issued by the Insurance Companies. The medical treatment given by the Provider shall be paid by the Paramount Health Services Pvt. Ltd. and the same will be claimed directly by the Paramount Health Services Pvt. Ltd., from the concerned insurance company under the provisions of the said Regulations.

General Provisions

- ❖ Paramount Health Services Pvt. Ltd., shall strictly adhere to the code of conduct stipulated under Regulation 21 of the said Regulations and the Provider should treat the patients with courtesy and care.
- ❖ Paramount Health Services Pvt. Ltd. shall issue an identity card to the patient bearing such identification mark, logo or wordings, with recent

photograph and signature or thumb impression of the patient. Paramount Health Services Pvt. Ltd. shall also issue an authority letter in favour of the patients. The Authority Letter shall interalia contain the guaranteed amount payable by the Paramount Health Services Pvt. Ltd. to the Provider.

- The Provider assures to the Paramount Health Services Pvt. Ltd. that the Provider has cover of adequate insurance policy against any error or omission in treatment as also negligence by its doctors and para-medical staff and shall keep such policies in force during the subsistence of this agreement.
- If necessary, the Provider shall allow with prior appointment, the authorised representatives to have access to the billing and medical records and indoor papers after the patient is discharged.
- The Provider hereby agrees to have the bills for the treatment provided to the patients, audited, only if the same is absolutely necessary.
- The Provider will convey to the Doctor treating the patient to keep the patient only for the required number of days of treatment and carry out only the required investigation and treatment for the ailment for which he/she is admitted and the decision in this regard of the attached Doctor shall be final. In the event of complications and/or emergency the treatment for the same will be included and permitted as necessary treatment and the attached Doctor shall at all times have the rights to treat the patient as he/she considers in his/her absolute discretion fit and necessary. Any other investigations required by the patient for his/her benefit are not reimbursable and hence not payable by the Paramount Health Services Pvt. Ltd. and the patient will have to bear the costs of the same.
- Authorisation letter will mention the amount, guaranteed class of admission, eligibility of the patient or various sub limits for rooms and board, surgical fees etc. whichever applicable, as per the benefit plan for the patient.
- The guarantee of payment is given only for the necessary treatment cost of the ailment covered and mentioned in authorization letter.

STAR HEALTH AND ALLIED INSURANCE CO. LTD.

The first stand along Health Insurance Co. in India formed under license from IRDA is the Star Health and Allied Insurance Company Limited. Star Health is a professionally managed company. Insurance Regulatory and Development Authority (IRDA) have granted us license to transact General Insurance Business with effective 16th March 2006. The Company has been formed with a strong fundamentals and sound financials. The capital base of the Company is Rs.105 crores, which is more than the capital required for General Insurance Company to transact all classes of business. However chosen to transact only Health Insurance business to reach the vast population of India. The Corporate Office is based at Chennai with branch offices all over the country. The Company provides various health related insurance solutions. Star Health motto to its policy holders is ***personal and caring***.

The Company operates through the diligent use of information technology. In addition to issuing of policy on-line, the entire services, information and hospital coverage will also be IT based. The Company offers cashless medical service facility and for this purpose the Company is in the process of empanelling hospitals.

Star Health is an insurance company licensed under IRDA to transact Health, Accident and Overseas Medical Insurance, providing Healthcare insurance coverage to its clients, for these purposes Star Health has created a network of service providers.

General Provisions

- The Provider shall treat Star Health beneficiaries in a courteous manner and according to good business practices.
- The Provider will extend priority admission facilities to the beneficiaries,. whenever possible.
- The Provider will have this facility covered by proper indemnity policy including errors, omission and professional indemnity insurance and agrees to keep such policies in force during entire tenure of the agreement.
- Provider shall ensure that the best medical treatment/ facility is extended to the beneficiary.

- Provider shall endeavour to have an officer in the administration department assigned for insurance/ contractual patient and the officers will eventually learn the various types of medical benefits offered by the different insurance plans.
- Provider shall allow Star Health official to visit the beneficiary and also to check the indoor papers/ treatment being given to the beneficiary. Star Health shall not interfere with the medical treatment of the patient. However the medical team of Star Health reserves the right to discuss the treatment plan with the treating doctor. Access to billing and medical records and indoor papers will be allowed to Star Health as and when necessary or asked for with prior appointment.
- Provider agrees to display their status of preferred provider of Star Health at their reception/ admission desks along with the display and other materials supplied by Star Health whenever possible for the ease of Star Health beneficiaries.

Identification of Beneficiaries

The beneficiaries will be identified by the Provider on the basis of an ID card issued to them bearing the logo and the wordings of Star Health. The ID card shall have photograph or signature or thumb impression of the beneficiary. In certain cases of large corporate where ID cards are not issued by Star Health. Beneficiary have only the Authority letter/ Pre-certification issued by Star Health along with the employee ID of the corporate.

- Provider has agreed to the continuation of the agreed tariff for a minimum period of two years from the date of signing of the agreement considering that Star Health is the Stand-along Health Insurer.
- The bill would need to be made available to Star Health along with the discharge summary at the time of discharge of the patient.
- The bills must be as per the agreed schedule of fees. Any higher amount will be deducted.
- Any non-covered treatment/ investigation cost must be recovered from the beneficiary.
- The final docket for onward submission to Star Health for immediate payment must contain the following:

- Copy of the beneficiary ID card with legible ID number.
- Copy of the first prescription collected from the beneficiary.
- Copy of preauthorization letter, beneficiary acceptance letter and duly signed claim form.
- Original final bill with detailed break up of miscellaneous, consumables and other charges.
- Original and complete discharge card/ summary mentioning the duration of ailment an duration of other disorders like hypertension or diabetes if any.
- Original investigation reports with corresponding prescription/ request.
- Pharmacy bill if supplied by hospital with corresponding request.
- Any other statutory documentary evidence required under law.
- Status of deposit paid if any, by beneficiary.

➢ Star Health agrees to pay all the eligible bills within 15 days of the receipt at their head office address in Chennai along with all the original relevant documents.

➢ In case certain billed items are not correlated with corresponding report, due intimation for the items not correlated would be given within seven days of the receipt of the bill. The Provider shall provide the requisite reports within seven days thereof and the bill shall be settled accordingly.

ICICI LOMBARD GENERAL INSURANCE CO. LTD.

POLICY IN A NUT-SHELL

Comprehensive Cover - Lump-sum benefit on diagnosis of Critical Illness/Major Medical Illnesses and Procedures, Personal Accident and Permanent Total Disablement (PTD) Cover

Sum Insured – Choice of coverage amount - Rs. 5,00,000 or Rs. 10,00,000

Eligibility - Age criteria at entry: Minimum 20 years, Maximum 45 years.

Policy Duration – 3 or 5 year period

Tax Benefit under section 80D of Income Tax Act

No health check-up

CRITICAL CARE

ICICI Lombard offers Critical Care Insurance; a first-of-its-kind policy that offers a lump-sum benefit on diagnosis of critical illness such as a heart attack, stroke, cancer, paralysis or kidney failure. It comes with an additional cover against Personal Accident and Permanent Total Disablement (PTD).

Coverage

The sum that could be Insured is Rs. 5,00,000 or Rs. 10,00,000. Critical Care Policy offers a 3 or 5 year period cover on account of any of the following:

- Major Medical illness and procedures
- Accidental Death
- Permanent Total Disablement (PTD) on account of Accident leading to inability to remain gainfully employed

Major Medical Illnesses and Procedures Cover

The Critical Care Insurance shall cover subsequent to 90 days from the date of policy for the following major medical illnesses:

1. Cancer
2. Bypass Surgery
3. Heart Attack
4. Kidney Failure
5. Major Organ Transplant
6. Stroke
7. Paralysis
8. Heart Valve Replacement Surgery
9. Multiple Sclerosis

Cancer

A disease manifested by the presence of a malignant tumor characterized by the uncontrolled growth and spread of malignant cells, and the invasion of tissue. The term cancer also includes leukemia and malignant disease of the lymphatic system such as Hodgkin's Disease.

But excluding:

- All tumors that are histological described as pre-malignant, non-invasive or carcinoma in situ, prostate tumors classified upto T1 (under the TNM classification).
- Tumors treated by endoscopic procedures alone
- Kaposi's Sarcoma or any other malignant tumor in the presence of any Human Immuno-deficiency virus.
- Any skin cancer other than invasive malignant melanoma (starting with Clark Level III)
- T1N0M0 (under the TNM classification System) papillary carcinoma of the thyroid less than 1 cm in diameter
- Tumors that pose no threat to life and for which no treatment is required
- Tumors that are a recurrence of metastasis of a tumor that first occurred prior to 180 days following the policy start date

Kidney Failure (End Stage Renal Failure)

End stage renal disease presented as chronic irreversible failure of both kidneys to function, as a result of which either regular renal dialysis (hemodialysis or peritoneal dialysis) is instituted or renal transplantation is carried out

Multiple Sclerosis

Unequivocal diagnosis of multiple sclerosis by a consultant neurologist holding such an appointment at a Government Hospital. The Insured must exhibit neurological abnormalities that have existed for a continuous period of atleast 6 months or must have had atleast two clinically documented episodes.

The above must be evidenced by the typical symptoms of demyelination and impairment of motor and sensory functions as well as by typical MRI findings

Major Organ Transplant

The receipt of a transplant of

- Human bone marrow using haematopoietic stem cells preceded by a total bone marrow ablation, or
- One of the following whole human organs: heart, lung, liver, pancreas or kidney, as a result of irreversible end stage failure of the respective organ
- A specialist Doctor confirms the requirement of same
- Other stem cell transplants and transplants of part of an organ are excluded

Heart Valve Replacement

The undergoing of medically necessary open heart surgery to replace a heart valve as a consequence of a heart valve defect. Surgeries using Balloon or catheter techniques are excluded

Coronary Artery Bypass Graft

The actual undergoing for the first time of an open chest coronary artery bypass surgery to correct narrowing or blockage of one or more coronary arteries with bypass grafts provided it is recommended by cardiologist and supported with coronary angiographic evidence but excluding balloon angioplasty and/or any other intra-arterial procedures or laser relief.

Stroke

The first occurrence of any cerebrovascular incident producing neurological sequel lasting more than 24 hours and including infarction of brain tissue, haemorrhage and embolisation from an extra cranial source.

The following must evidence the diagnosis for the same:

- Finding on Magnetic Resonance Imaging, Computerised Tomography or any other reliable imaging techniques, demonstrate a lesion consistent with the acute haemorrhage, embolism or thrombosis.

- Neurological deficit for atleast 3 months Transient Ischaemic Attacks and/or Brain damage due to an accident, infection, vasculitis or an inflammatory disease are excluded.

Paralysis

Complete and permanent loss of function of two or more limbs as a result of Injury or Illness of the brain or spinal cord. Permanent loss of function of two or more limbs shall be deemed to have occurred if:

- The condition has persisted for at least 6 months from the date it was first suffered in spite of the Insured properly implementing all medical advice related to its cure, and
- A Doctor of central or a state government hospital confirms complete, irreversible and permanent loss

Paralysis resulting directly or indirectly or as a consequence of any self-inflicted injury is excluded.

Myocardial Infarction (Heart Attack)

The first occurrence of an acute myocardial infarction leading to the death of a portion of heart muscle (Myocardium) as a result of inadequate blood supply to the relevant area. The diagnosis for the same must be evidenced by all of the following:

- An episode of typical chest pain.
- The occurrence of a typical new acute infarction changes (ST-T elevation) on the electrocardiograph and progressing to development of pathological Q waves
- Elevation of Cardiac Troponin (T or I) to atleast 3 times the upper limit of normal reference range or an elevation in CPK-MB to atleast 200% of the upper limit of the normal reference range

But excluding non-STEMI with elevation of troponin I or T. Other acute coronary syndromes including but not limited to angina or chest pain are excluded from this definition.

Accidental Death Cover

Compensation paid on death of insured person on account of bodily injury sustained in an accident within the policy period.

Permanent Total Disablement (PTD) Cover

Compensation paid for PTD on account of bodily injury sustained in a accident resulting in total and irrecoverable loss of use or the actual loss by physical separation of the limbs / sight. This compensation is payable provided the disablement results in inability to remain gainfully employed.

Loss of use/Actual loss by physical separation of	***Percentage of Capital Sum Insured****
Sight of both eyes	100%
Both hands	100%
Both feet	100%
One hand and one foot	100%

*As stated in Part I of the Schedule.

Note: If any such injury as mentioned above shall result in the inability to remain gainfully employed, then the Capital Sum Insured payable will be 100%.

3. Need for Critical Care

- India has over 60 million coronary heart patients.
- India's economic loss due to heart related disease could be $236 billion till 2015.
- At any given time there will be 3 million cancer patients in India.

Source: World Health Organization (WHO)

However, today, with the advancement in medical science, solutions have been developed for virtually any ailment in the world. A study revealed that 50%

of cancers are curable if detected early. But it has also led to rising costs of treatment.

Procedure	*Cost (US$)*
Bone Marrow Transplant	69,000 (approx. Rs. 31, 74,000)
Liver Transplant	69,000 (approx. Rs. 31, 74,000)
Heart Surgery	8,000 (approx. Rs. 3,68,000)
Cataract Surgery	6,000 (approx. Rs. 2,76,000)
Orthopedic Surgery	1,250 (approx. Rs. 57,500)

CRITICAL CARE EXCLUSIONS

Exclusions applicable to Critical Illness:

90 Days Exclusion: Any illnesses and procedures within 90 days from start date of policy will not be covered. This clause does not apply for subsequent renewal (without a break) of this policy with us.

Permanent Exclusion: The Company shall not be liable under this policy for:

- Any Pre-Existing illness
- Absence of submission of Doctor's medical certificate confirming the diagnosis of Illness or Injury or undergoing of medical/surgical procedure
- Any congenital Illness or condition
- Any medical procedure or treatment, which is not medically necessary or not performed by a Doctor
- Any physical, medical or mental condition, illness, injury or treatment or service which is specifically excluded under the Policy
- Treatment relating to birth defects and external congenital Illnesses
- Birth control procedures and hormone replacement therapy

- Any treatment/ surgery for change of sex or any cosmetic surgery or treatment
- Treatment by family member and self-medication or any treatment that is not scientifically recognized

Exclusions applicable to Personal Accident:

The Company shall not be liable under this policy for:

- Compensation/claim under more than one of the categories specified in the Policy Coverage in respect of the same period of disablement of the Insured Person
- Claims arising out of sickness/illness
- Death, injury or disablement of Insured Person
    - from intentional self-injury, suicide or attempted suicide
    - from engaging in adventure sports
    - Participation in any professional sports for which the insured is untrained
    - whilst under the influence of intoxicating liquor or drugs
    - whilst engaging in aviation or ballooning, or whilst mounting into or dismounting from or travelling in any balloon or aircraft other than as a passenger (fare-paying or otherwise) in any duly licensed standard type of aircraft anywhere in the world
    - directly or indirectly caused by venereal disease or insanity
    - arising or resulting from the Insured committing any breach of the law with criminal intent
    - war, invasion, act of foreign enemy, hostilities (whether war be declared or not) civil war, rebellion, revolution, insurrection, mutiny, military or usurped power, seizure, capture, arrests, restraints and detainment of all kind
    - Nuclear weapon induced treatment
    - Childbirth or pregnancy or in consequence thereof
- Permanent Total Disablement prior to commencement of the policy

DOCUMENTS REQUIRED FOR MAKING A CLAIM

The documents required for making a Critical Illnesses Claim are as follows:

- Doctor's Certificate confirming the following:
  - Insured person's name
  - Name, date of occurrence and medical details of the illness/surgery
- Confirmation of the absence of any pre-existing Illness or Injury within the first 3 months of commencement of policy
- Duly completed claim forms
- Original Discharge Certificate/ Card from the hospital/ Doctor
- Original investigation test reports, indoor case papers

Personal Accident Claim

The documents required for making a Personal Accident claim are as follows:

- Duly completed claim form
- Doctor's Report
- First Information Report and Final Police report, wherever necessary
- Death certificate, wherever applicable
- Investigation Reports like Laboratory test, X-rays and reports essential for confirmation of the Injury
- Disability certificate from a government certified Doctor or government hospital confirming the extent and nature of disability
- Post mortem report, if applicable
- Any other supporting documents as may be required by the Company

Procedure for making a Claim

Log a claim by giving immediate notice in writing to the Company

i) Critical Illness Claim: Intimate ICICI Lombard within 30 days from the date of diagnosis of the concerned illness/surgical procedure

ii) Personal Accident Claim: Intimate ICICI Lombard within 7 days from the date of occurrence of the accident/ injury

Submit all reasonable documents - information, assistance and proofs in connection with any claim within 30 days from the occurrence of the event.

Review Questions:

1. State how the Life Insurance protects the individuals with medical problems?
2. Explain different types of medicare services.
3. Discuss the role of ICICI Lombard Insurance Company in providing critical care insurance.
4. Explain the medical insurance cover provided by Paramount Health Services Private Limited.
5. Write a note on the medical insurance services provided by Star Health and Allied Insurance Co. Ltd.
6. State the contribution of Family Health Plan Ltd (FHPL) in providing medical insurance.

* * *

MODEL QUESTION PAPER

Paper 4.2: HOSPITAL HAZARDS MANAGEMENT

Time: 3 hours   Max: 100 Marks

PART A   (5 x 8 = 40 marks)

Answer any **Five** questions
All questions carry equal marks.

1. What are the measures to be taken for protection of health of the workers?
2. What are the hospital hazards for the people working in the hospitals?
3. What are the objectives of hospital hazard management plan?
4. Explain the process of monitoring and control of cross infection.
5. What are the hazards and risk due to exposure of hazardous waste?
6. Explain the methods of disposal of sewage waste.
7. Explain different types of medicare services.
8. State the contribution of Family Health Plan Ltd. in providing medical insurance.

PART-B   (4 x 15 = 60 marks)

Answer any **Four** questions
All questions carry equal marks.

9. Explain different kinds of occupational hazards.
10. What are the causes for the hospital related infection? How to prevent them?
11. Explain the guidelines for handling and disposing of bio-medical waste.
12. Explain the methods of excreta disposal.
13. Discuss the role of ICICI Lombard Insurance Co. in providing critical care insurance.
14. Describe the role and functions of Central Sterile Supply Department.
15. How to assess the standards of performance in risk and hazards surveillance?

ଔଡ଼